







COMMERCIAL FISHERIES *Review*

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Fishes



COVER: A shrimp catch being landed aboard the charter vessel M/V "Yaquina" in Yakutat Bay, Alaska.

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.



FISHERMEN'S MEMORIAL - GLoucester, MASS.

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Landing a yellowfin tuna aboard a research vessel in the Indian Ocean. (Photo: Richard S. Shomura, BCF Biological Laboratory, Honolulu, Hawaii.)

1966 WAS A GOOD YEAR FOR U. S. FISHERIES

United States fisheries had a good year in 1966. The shrimp fishery became the first to approach the \$100 million level. Tuna prices reached new highs at the beginning of the year. The salmon catch was one of the largest and best balanced in recent years.

On the other side of the ledger, the small menhaden catch was the biggest disappointment. (But the North Carolina fall menhaden fishery was good.) The low scallop prices and the reduced catches during the last part of 1966 made for a poor scallop fishery.

The year 1966 ended with prices received by fishermen about 16 percent above the 1957-59 average, seasonally adjusted. In comparison, the index of prices received by farmers for meat animals was up about 12 percent.

Annual dockside (exvessel) prices, on average, had remained quite stable from 1956 to 1964. In 1965, exvessel prices for both shellfish and finfish jumped about 8 percent over 1964; in 1966, they rose another 7 percent. The 1966 index of shellfish prices was 112 percent of the 1957-59 average; the same index of finfish was 116 percent.

Shrimp Prices Rose But Other Shellfish Prices Fell

Shrimpled all species with prices 124 percent of the 1957-59 average. The 1965 index of exvessel shrimp prices was only 103. This means exvessel shrimp prices increased about 21 percent from 1965 to 1966.

The average prices for other shellfish--including blue crabs, hard and soft clams, Northern lobsters, Eastern oysters, and sea scallops--were 103 percent of the 1957-59 average--a drop of 12 percent from 1965. Practically all of this drop was due to the drastic decline in scallop exvessel prices. Scallop prices were about 5 percent below the 1957-59 average. This was due almost entirely to the record scallop stock levels at the beginning of 1966.

The 1966 wholesale prices of industrial fishery products are 20-30 percent above the 1957-59 average but only about 5 percent above the 1965 level. The good world demand for both fish meal and fish oil has maintained these prices.

New England Finfish Prices Climbed 20%

New England finfish prices in 1966 were 18 percent above the 1957-59 average. Included in this group are the cod, flounders, haddock, and ocean perch. This was a 20 percent increase over the 1965 exvessel New England finfish price.

The exvessel prices of Pacific salmon have been quite stable in the past 2 years. The price indexes for 1964, 1965, and 1966 were 111, 110, and 113, respectively, with 1957-59 equalling 100.

Unlike salmon prices, there has been considerable fluctuation in exvessel tuna prices in the past couple of years. Included in the tuna group are the albacore, bluefin, skipjack, and yellowfin. The 1966 tuna prices will average about 120 percent of the 1957-59 average. This is an increase of about 20 percent over 1965 prices and 25 percent over 1964 prices. This annual index obscures the fact that prices during the first 3 months were 30 to 45 percent above the 1957-59 average.

Exvessel, Wholesale and Retail Prices Generally Move Together

In most U. S. fisheries, the exvessel price fluctuates more on a percentage basis than do wholesale or retail prices. The processors and retailers estimate what price they can obtain for the current volume and subtract their costs to determine the price they can afford to pay the fishermen. The exvessel value becomes the residual value after the processing and marketing costs are deducted. While marketing margins do vary slightly from month to month, exvessel, wholesale, and retail prices generally move up and down together. (BCF Branch of Current Economic Analysis.)



UNITED STATES

Industrial Fishery Products

FISH MEAL SUPPLY IS UP 13.1%,
SOLUBLES DOWN 14%

Based on domestic production and imports, available supply of fish meal in the United States for the first 10 months of 1966 was 548,549 short tons--63,411 tons (or 13.1 percent) more than during the same period in 1965. Domestic production was 53,220 tons (or 24.1 percent) lower, but imports were 127,315 tons (or 50.1 percent) higher than in January-October 1965. Peru was the leading source with shipments of 239,323 tons.

U. S. Supply of Fish Meal and Solubles, January-October 1966			
Item	Jan.-Oct.		Total 1965
	1966	1965	
. . . (Short Tons): . .			
Fish Meal and Scrap:			
Domestic production:			
Groundfish	8,954	9,797	10,696
Herring	10,690	12,340	12,932
Menhaden 1/.	113,952	161,403	175,959
Tuna and mackerel	25,594	21,389	25,399
Unclassified	8,047	15,528	17,360
Total production 2/.	167,237	220,457	242,346
Imports:			
Canada	38,833	36,866	43,830
Peru	239,323	204,841	209,801
Chile	69,904	5,201	5,651
Norway	18,954	49	78
So. Africa Rep.	6,040	2,900	5,100
Other countries	8,258	4,140	6,206
Total imports	381,312	253,997	270,666
Available fish meal supply	2/ 548,549	485,138	524,717
Fish Solubles 3/:			
Domestic production			
	74,774	87,637	94,839
Imports:			
Canada	1,223	1,293	1,488
Peru	1,941	1,504	2,598
Mexico	351	207	227
Other countries	360	825	825
Total imports	3,875	3,829	5,138
Available fish solubles supply	78,649	91,466	99,977
1/Includes other species.			
2/Does not include a small quantity of shellfish and marine animal meal and scrap because production data are not available monthly.			
3/Wet-weight basis except for imports from South Africa Republic (included in "other countries").			
Source: BCF and U. S. Department of Commerce, Bureau of Census.			

The U. S. supply of fish solubles during January-October 1966 was 78,649 tons--down 14.0 percent from the 1965 period.

Domestic production of fish solubles decreased 14.7 percent, but imports of fish solubles increased 1.2 percent.

* * *

FISH MEAL, OIL, AND SOLUBLES PRODUCTION DECREASES

During October 1966, about 8.7 million pounds of marine animal oils and 10,843 tons of fish meal were produced. Compared with October 1965, this was a decrease of 777,000 pounds of marine animal oils and 1,478 tons of fish meal and scrap. Fish solubles production was 5,588 tons--a decrease of 1,091 tons from October 1965.

U. S. Production of Fish Meal, Oil, and Solubles, October 1966 ¹ /with Comparisons				
Product	Oct.		Jan.-Oct.	
	1/1966	1965	1/1966	1965
. (Short Tons).				
Fish Meal and Scrap:				
Groundfish	993	450	8,954	9,797
Herring	896	718	10,690	12,340
Menhaden 2/	6,246	7,036	113,952	161,403
Tuna and mackerel	2,718	2,680	25,594	21,389
Unclassified	-	1,437	8,047	15,528
Total 3/	10,843	12,321	167,237	220,457
Fish Solubles:				
Menhaden 2/	4,405	4,197	56,197	68,865
Unclassified	1,183	2,482	18,577	18,772
Total	5,588	6,679	74,774	87,637
. (1,000 Pounds).				
Oil, body:				
Groundfish	198	132	1,456	2,270
Herring	442	386	7,046	8,171
Menhaden 2/	7,170	7,333	123,685	165,778
Tuna and mackerel	870	711	4,452	3,993
Unclassified (inc. whale)	-	895	4,178	3,929
Total oil	8,680	9,457	140,817	184,141
1/Preliminary data.				
2/Includes a small quantity of other species.				
3/Does not include a small quantity of shellfish and marine animal meal and scrap because production data are not available monthly.				
Source: BCF.				



Imports of Fish Meal and Scrap Rose 50%

Imports of fish meal and scrap during the first 10 months of 1966 were 50.1 percent higher than the 1965 period.

U. S. Imports of Fish Meal and Scrap by Principal Areas ^{1/}		
Area	January-October	
	1966	1965
	..... (Short Tons)	
Maryland	76,219	52,160
Georgia	72,937	39,773
Mobile (Ala.)	75,221	48,540
Texas	20,584	12,276
Los Angeles (Calif.)	18,376	17,943
San Francisco (Calif.)	49,178	33,053
Washington	18,849	18,296
Duluth (Minn.) & Superior (Wis.)	4,373	7,309
Other	45,574	24,617
Total	381,312	253,967

^{1/}Imports were previously shown by Customs Districts; now they are shown by principal areas.



Shrimp Imports Rose Nearly 9%

Imports of all shrimp (fresh, frozen, canned, and dried) from all countries for January-October 1966 were 140.4 million pounds -- compared with about 129.4 million pounds for the 1965 period, up 8.6 percent. Imports from Mexico totaled about 50.3 million pounds, an increase of 13.7 percent from the 44.2 million pounds of the 1965 period.



Can Shipments for Fishery Products Increase



During January-September 1966, 2,408,898 base boxes of steel and aluminum were used to make cans shipped to fish and shellfish canning plants. This compares with 2,324,148 base boxes used during the 1965 period.

Note: Statistics cover all commercial and captive plants known to be producing metal cans. A "base box" is an area of 31,360 square inches, equivalent to 112 sheets 14" x 20" size. Tonnage figures for steel (tinplate) cans are derived by using factor 23.7 base boxes per short ton of steel.

Source: U. S. Department of Commerce, Bureau of Census.



Pacific Coast Canned Salmon Stocks Are 20% Above 1965

On November 1, 1966, the U. S. pack of Pacific canned salmon, including Alaska's, was 4,253,272 standard cases. This was 20.1 percent above the 1965 pack of 3,541,187 cases. By species, the new pack was made up of (1965 pack in parentheses): king, 77,170 standard cases (95,503); red, 1,425,920 cases (2,013,077); coho, 190,866 cases (170,064); pink 2,004,529 cases (951,688); chum, 554,787 cases (310,855).

Data on canned salmon stocks are based on reports from U. S. Pacific Coast cannery who packed over 96 percent of the 1966 salmon pack. (Division of Statistics and Economics, National Cannery Association, Dec. 9, 1966.)



Wholesale Prices/Indexes for Edibles, November 1966

From October to November 1966, wholesale prices were lower for several principal items: haddock, fresh and frozen fillets, shrimp, and canned salmon; rose for others, and were unchanged for some. At 125 percent of the 1957-59 average, the overall wholesale price index for edible fishery products in November dropped 4.8 percent from October. Compared with November 1965, November 1966's index was 4.7 percent higher because most products were generally higher.

Lower prices at Boston for ex-vessel large haddock, down 29.8 percent from October to November, were largely responsible for 11.2-percent drop in November's subgroup index for drawn, dressed, or whole finfish. In New York City, prices were lower for frozen king salmon and Great Lakes fresh yellow pike, but slightly higher for frozen western halibut. Compared with November 1965, prices were sharply lower for haddock (down 19.7 percent) and yellow pike (down 16.2 percent) because of better supplies, and slightly lower for king salmon (down 1.7 percent). As a result, the subgroup index was down 5.8 percent from the 1965 month.

The processed fresh fish and shellfish subgroup index dropped 7.6 percent from

Wholesale Average Prices and Indexes for Edible Fish and Shellfish, November 1966 with Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices 1/ (\$)		Indexes (1957-59=100)			
			Nov. 1966	Oct. 1966	Nov. 1966	Oct. 1966	Sept. 1966	Nov. 1965
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					125.0	131.3	131.4	119.4
Fresh & Frozen Fishery Products:					126.5	136.1	137.0	122.7
Drawn, Dressed, or Whole Finfish:					121.0	136.2	135.6	128.5
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.15	.21	115.2	164.0	114.5	143.4
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.48	.47	142.0	139.0	142.0	140.5
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.86	.93	120.2	129.6	139.7	122.3
Whitefish, L. Superior, drawn, fresh	Chicago	lb.	.63	.62	93.3	91.8	123.1	85.8
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.65	.67	106.4	106.9	143.2	126.9
Processed, Fresh (Fish & Shellfish):					127.6	138.1	137.6	124.2
Fillets, haddock, sm., skins on, 20-lb. tins	Boston	lb.	.47	.54	114.2	131.2	109.3	115.4
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	1.03	1.12	120.1	131.2	130.1	106.6
Oysters, smoked, standards	Norfolk	gal.	8.25	8.75	139.1	147.5	151.8	147.6
Processed, Frozen (Fish & Shellfish):					125.1	128.6	132.0	110.9
Fillets, Flounder, skinless, 1-lb. pkg.	Boston	lb.	.44	.43	110.2	109.0	106.4	103.9
Haddock, sm., skins on, 1-lb. pkg.	Boston	lb.	.40	.40	117.3	115.8	118.7	117.3
Ocean perch, lge., skins on 1-lb. pkg.	Boston	lb.	.30	.32	103.5	110.5	112.2	112.2
Shrimp, lge. (26-30 count), brown, 5-lb. pkg.	Chicago	lb.	1.11	1.16	131.0	137.5	142.3	107.3
Canned Fishery Products:					122.9	123.3	122.0	114.0
Salmon, pink, No. 1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	27.50	28.00	119.9	122.0	122.0	117.7
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	12.95	12.95	115.0	115.0	115.0	102.6
Mackerel, jack, Calif., No. 1 tall (15 oz.), 48 cans/cs.	Los Angeles	cs.	8.50	8.00	144.1	135.6	135.6	120.9
Sardines, Maine, keyless oil, 1/4 drawn (3-3/4 oz.), 100 cans/cs.	New York	cs.	11.25	11.25	144.3	144.3	131.5	131.5

1/Represent average prices for one day (Monday or Tuesday) during week in which 15th of month occurs. Prices are published as indicators of movement, not necessarily absolute level. See daily Market News Service "Fishery Products Reports" for actual prices.

Source: U. S. Department of Labor, Bureau of Labor Statistics.

October to November 1966 because of lower prices for all items. Prices were down 8.5 percent for South Atlantic fresh shrimp at New York City and 5.7 percent for standard shucked oysters at Baltimore because of very good oyster production. The subgroup index in November 1966 was 2.7 percent higher than November 1965 solely because fresh shrimp prices were up 12.7 percent. Prices for standard shucked oysters (down 5.8 percent) were lower than in November 1965.

Index Down For Frozen Processed Items

Lower prices from October to November for frozen ocean perch fillets (down 6.3 per-



Oyster shucker.

cent) at Boston and frozen shrimp (down 4.7 percent) at Chicago produced 2.7-percent drop in subgroup index for frozen processed fish and shellfish; prices for other species of frozen fillets were slightly higher. The subgroup index rose 12.8 percent over November 1965 because of higher shrimp prices (up 22.1 percent). Prices for flounder fillets were 6.1 percent higher than November 1965; for ocean perch fillets 7.8 percent lower.

The subgroup index for canned fishery products dropped 0.3 percent from October largely because canned pink salmon prices were down 1.7 percent. November prices were 6.3 percent higher for California jack mackerel, and unchanged for other group items. November 1966 prices were substantially higher than November 1965 for nearly all canned fish products; subgroup index was up 7.8 percent. Prices for canned salmon were up slightly. (BCF Market News Service.)



U.S. Adopts 12-Mile Fishery Zone

On October 14, 1966, President Johnson signed into law P.L. 89-658 to establish an exclusive fisheries zone for the United States 12 miles from the baseline from which the territorial sea is measured--9 miles of fisheries jurisdiction beyond the 3-mile territorial sea. Traditional foreign fishing recognized by the United States may continue in this zone.

The enactment of the law means that the United States is not now in a position to contest the right of other nations to similar exclusive 12-mile limits. However, this nation will endeavor to maintain traditional fishing rights that U. S. fishermen may have established in such zones. The United States action has no effect on traditional freedoms of the sea.

As a consequence of the new law, the Fishermen's Protective Act (P. L. 680-83) will no longer cover reimbursement of fines paid by U. S. fishermen following seizures within exclusive fisheries zones up to, and including, 12 miles in width claimed by some countries.



Seashore Damage Blamed for Fish Decline

Coastal fish resources of the Atlantic have reached a "critical condition," according to an annual resource report of the American Littoral Society. The society is a national aquatic conservation group based at the Sandy Hook Marine Laboratory, Highlands, N. J. The report says that much of the scarcity of fish may be due to pollution and the general disruption of the coastal area.

The society used BCF statistics in its analysis. These showed that commercial catches of 18 Atlantic coastal species were down nearly 50 percent from 1960 to 1965--from 1,400 million pounds to 700 million pounds. Major cause of the downward trend was the sharp drop in catches of menhaden; from 1,176 million pounds in 1960 to 530 million pounds in 1965.

Other prime species showed a downward trend on the Atlantic coast from Maine to Florida: fluke, croaker, spot, and porgy; together, they dropped from an index level of

88 to 58 million pounds. These important sport fishes, like the commercial menhaden, may be suffering from lack of good breeding grounds.

Coastal Areas Destroyed

The babies of most coastal species live in the marshes and very shallow waters along the edges of bays and tidal rivers, where they find protection and rich food. In recent years, these areas have been destroyed relentlessly or filled over for house lots, garbage dumps, or industrial sites. Without these sanctuaries, many young perish.

The report says that pollution of coastal bays also is harsh on young coastal fish, conditioned by nature to live in clean shore waters. Fishes migrating along the coast could easily be repelled by the filth pouring into the bays and continue on their way looking for better habitat.

However, sea fish that go up into the fresh waters of coastal tributary rivers for spawning appear to be better off. River spawners showing an upward trend over the 5-year period were river herring and shad, 56 to 72 million pounds. Those showing a slight downward trend were striped bass and white perch, 11 to 10 million pounds.

Bluefish and mackerel increased from an index of 6 to 9 million pounds. These are coastal species whose habitat seems least affected by man's progress.



Fish Diet Reduces Incidence of Heart Attacks

Men who ate fish 5 times a week for lunch and dinner for 5 years suffered only a third as many heart attacks as men in a control group. Hypertension and obesity also were reduced. The fish eaters, 814 men 40-59 years old, were members of a New York "anti-coronary" club who volunteered to take part in a study seeking ways of preventing heart disease. The control group consisted of 463 men of the same ages.

The club members followed a "prudent diet" prescribed by the New York City Department of Health, reports the Department's Dr. Seymour H. Rinzler. They ate much fish,

substituted margarine for butter, sherbet for ice cream, and soft cheeses for hard. Chicken, veal, and lamb were the main meat choices, but one pound of beef or pork was allowed weekly. The rest of the diet consisted of a maximum of 4 eggs a week, one ounce of oil daily, bread, and cereals.

Dr. Rinzler said anti-coronary clubs are starting up in many communities. He cited as examples 5 in New York State, 1 in Chicago, and 1 in Burlington, Vt. (Reprinted, with permission from "Science News," weekly summary of current science, copyright 1966 by Science Service, Inc.)



Inventions

NEW METHODS OF PREPARING AND FREEZING LOBSTERS AND CRABS

A patent was granted recently on a "method of preparing and freezing lobsters and crabs." The method prepares whole lobsters (Atlantic or *Homarus americanus*) for freezing for indefinite storage. Thus, the lobster may be kept for long periods and the meat does not freeze to the shell, which makes it easier to remove on normal thawing. The same method also may be used with other shellfish, such as crabs. (U. S. Patent No. 3,261,693, to Ruth W. Jung, Jung International Food Corp., 217 Broadway, Amityville, N. Y. 11701.)

* * *

PROCESS TO EXTRACT RAW MEAT OF SPINY LOBSTER

A patent was granted recently on a "process for extracting raw meat from the shell of the body-section of the spiny lobster." This was formerly discarded as waste because it was difficult to extract under ordinary conditions and temperatures. An important objective of the process is to extract the meat in one piece, in prime condition, and with a minimum of mutilation in order to produce an attractive product for the market.

The manual process is executed with modified simple hand tools. The inventors claim the same process can be used to extract raw meat from the shell of the body-section of the northern or Atlantic lobster. (U. S. Patent No. 3,276,070, to Joseph M. and Frank J. Kaspar, 6750 SW. 8th St., Miami, Fla. 33144.)



Humphrey Visits BCF's Miami Lab

Vice President Hubert H. Humphrey, acting as chairman of the new Marine Resources Council, and Cong. Dante Fascell of Florida visited the University of Miami and BCF's Tropical Atlantic Biological Laboratory on December 8, 1966. BCF Regional Director Seton Thompson and Laboratory Director Thomas Austin greeted the Vice President and staff and briefed them on the Bureau's program in the Gulf and Tropical Atlantic. Thompson emphasized the possibilities of fish protein concentration (FPC). During his visit, the Vice President appeared especially interested in FPC, international cooperation, and the processing and transmission of oceanographic data. From the laboratory the vice-presidential party went on to the docks to tour the "R/V Undaunted."



Lamprey Control Gains, Great Lakes Commission Told

Biologists of the Canadian Department of Fisheries and BCF reported good progress in lamprey control in Lakes Superior, Michigan, and Huron to the recent meeting of the Great Lakes Fishery Commission. Lampreys have been reduced by over 90 percent in Lake Superior and lake trout are thriving. Catch quotas for 1967 have been increased 70 percent over 1966--permitting the harvest of 400,000 pounds of trout.



Oceanography

DISCOVER UNDERSEA MOUNTAINS, RIDGES, AND SEA BASINS IN NORTH PACIFIC

The discovery of uncharted undersea mountains, mountain ridges, and sea basins in the North Pacific and Bering Sea was disclosed on December 27, 1966, when the U. S. Department of Commerce published 6 new maps of the sea floor surrounding the Aleutian Islands. The bathymetric maps were produced by the Department's Environmental Science Services Administration (ESSA).



Diagonal markings show area covered by new Aleutian Island sea-bottom maps.

They cover about 400,000 square statute miles of seabed where thousands of earthquakes are spawned each year. Almost 25 years of work went into their preparation. They were compiled from more than 275 hydrographic surveys by vessels of ESSA's Coast and Geodetic Survey between 1943 and 1964--among them, the "Pioneer," "Surveyor," "Explorer," and "Pathfinder."

The maps cover the seabed adjacent to the Aleutian Islands from Unimak Island on the east to submerged Stalemate Bank, 45 statute miles west of westernmost Attu Island. The area extends from a few miles south of the Aleutian Trench to about 350 statute miles north; it includes the southern portion of the Bering Sea and the submerged mountain range (Bowers Ridge) extending northward into the Bering Sea.

Provides Knowledge About Geologic Forces

The detailed portrayal of submarine topography of the island chain can provide better understanding of the geologic forces shaping the ocean floor in this seismically active area. It will enable seismologists to determine changes in the sea floor resulting from major earthquakes. The maps can prove valuable to scientists in associated disciplines--physical and biological oceanography, geophysics, and commercial fisheries.

Many features, such as the immense Aleutian Trench, are shown in greater detail than before. This trench parallels the arc about 75 miles to the south of the Aleutian Islands and has a maximum depth of over 25,000 feet.

Positions of the soundings within sight of land were obtained by standard visual fixes, positions of offshore soundings were located by electronic positioning devices. Depths were secured with echo sounders that create a continuous profile of the ocean floor.

The six maps, on a scale of 1:400,000, may be ordered by number for 50 cents each from the Coast and Geodetic Survey, Environmental Science Services Administration, Rockville, Md. 20852.

A text describing the shape of the ocean floor in the area covered by the maps is expected to be available early in 1967.

* * *

NAVAL OCEANOGRAPHERS PLANT ACRE OF BUOYS

A team of oceanographers and technicians from the U. S. Naval Oceanographic Office planted "an acre of buoys" about half way between Cape Hatteras and Bermuda. The object is to measure and interpret the dynamic characteristics of the ocean in a small area.

It was planned to take measurements at intervals of 15 minutes to one hour for 6 weeks to 6 months with sensing arrays moored down to 17,000 feet. All instruments are self-recording on either 16mm film or scratch-type strip chart.

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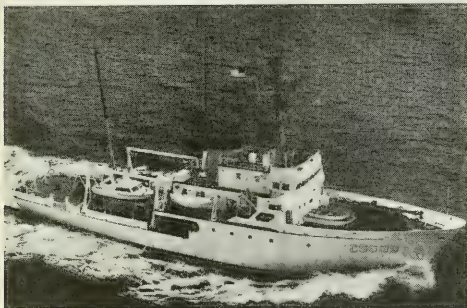
HYDROGRAPHIC SHIP IS COMMISSIONED, A SECOND CHRISTENED

The \$2.4 million survey vessel USC&GSS "McArthur" was commissioned December 15, 1966, at the Coast and Geodetic Survey's Atlantic Marine Center, Norfolk, Va., announced the U. S. Department of Commerce's Environmental Science Services Administration (ESSA).

The 175-foot, 995-ton, air-conditioned ship is built of welded steel strengthened for navigation in ice, propelled by diesel engines with twin-screw reversible-pitch propellers, and equipped with specialized depth recorders and positioning equipment. It has crew accommodations for 36 officers and men.

The McArthur, essentially, is a hydrographic survey ship, but can conduct various

sophisticated oceanographic investigations. Her first assignment, until mid-June 1967, will be gravity measurements on the East Coast between Cape Hatteras, N. C., and Key West, Fla. This is part of a program to determine properties of the continental shelf.



Hydrographic survey ship, USC&GSS McArthur. Photo: ESSA.

In July 1967, the ship is scheduled to arrive at her home base in Honolulu. She will carry out hydrographic and current surveys, magnetic and gravity observations, and oceanographic research.

A second Department of Commerce hydrographic survey vessel, the \$4.3 million USC&GSS "Mt. Mitchell," was christened November 29, 1966, in Jacksonville, Fla.

The 231-foot, 1,627-ton vessel has a welded steel hull strengthened for navigation in ice; twin-screw diesel engines equipped with reversible-pitch propellers; engine room monitored by centralized automated system; a bow thruster; electronic, depth recording, and positioning equipment; and accommodations for 80 officers, crew, and scientists.

The Mitchell and two sister ships, "Fair-weather" and "Rainier," are scheduled to be completed in 1967. They are designed to chart U. S. coastal waters to meet navigational needs, and to conduct oceanographic work on the continental shelves and slopes.

ENVIRONMENTAL SAMPLER CAN HELP UNDERSEA STUDY

A deep-ocean environmental sampler developed by 4 Naval Research Laboratory scientists can take samples at great depths

in any liquid and fluid environment of extreme pressure.

The sampler will permit scientists to study mud and water at the same temperature and pressure as they are found in their natural state. Seawater samplers now in use cannot hold a sample at the temperature and pressure at which it is taken. The device also will be used to determine whether samples of mud and water are altered by depressurization while being raised to the surface.

The sampler is essentially 2 coaxial cylinders with an internal double-ended piston rod. The water sample is captured between the two pistons as it slides into the cylinders under gravitational or spring loading. Patent issued to: Chester L. Buchanan, Jervis J. Gennari, Howard E. Barnes, and Walter L. Brundage Jr. ("Science News," copyright 1966.)

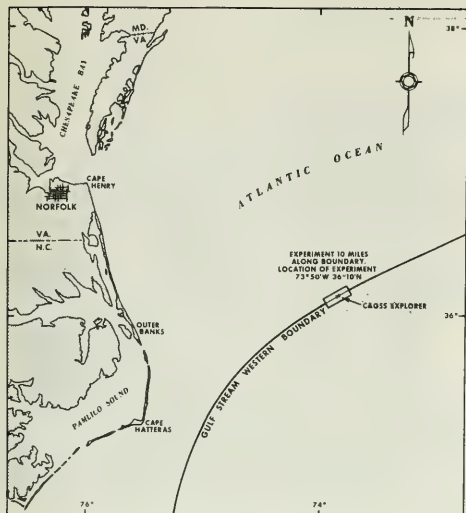
HIGH-SPEED HYDROFOIL BOAT IS SUITABLE FOR OCEANOGRAPHIC WORK

Tests show that it is feasible to use high-speed hydrofoil boats in making echo soundings in hydrographic survey work, reports the U. S. Naval Oceanographic Office. Data analysis indicates that equipment worked favorably in shallow and deep water, over seaweed, rock, and sandy bottom. The speed of the hydrofoil was varied and had no adverse effect on readings.

The echo sounder differs from traditional types used in hydrographic surveying. Instead of relying on measurement of the transit time for single sound impulses, it used a continuous wave frequency modification principle.

STUDY GULF STREAM FROM SEA AND AIR

A 10- by 3-mile section of the Gulf Stream was tested intensively in October 1966 by 3 Government agencies seeking to learn more about the mysterious "ocean river." This was reported last month by the Environmental Science Services Administration (ESSA), U. S. Department of Commerce.



Segment of Gulf Stream where tests were made.

The tests were conducted 150 to 400 miles off the North Carolina coast by the USC&GS Ship "Explorer" of ESSA's Coast and Geodetic Survey, and aircraft of the Navy Oceanographic Office and the Manned Spacecraft Center of NASA.

The results are being processed and studied. The tests are part of a larger study of the Gulf Stream underway for more than a year by 15 governmental and private groups.

The ship and planes communicated constantly by radio. The planes were equipped with aerial cameras, infrared and microwave sensing instruments, and radar.

One instrument was an infrared line scanning image system which photographed the Gulf Stream's western boundary. The instrument records on film small differences in the ocean surface's temperature. The Gulf Stream is warmer than the coastal waters that form its western terminus. The cold water appears lighter on the film than the warmer Gulf Stream, so the Gulf Stream's western limits show up clearly. ESSA believes that if the expected results materialize, the way may be open for showing on film, on a regular basis, both surface boundaries of the Gulf Stream. Although the western border now is known, it keeps changing. The stream's eastern edge is more difficult to identify because the small thermal difference between Gulf Stream and eastern water makes its boundary less distinct. The image system used in the tests may detect the small heat differences and produce useful results.



Created in 1849, the Department of the Interior—America's Department of Natural Resources—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.



STATES

Alaska

UPGRADES SKILLS OF FISHERMEN

The first of two 14-week courses to upgrade skills of fishermen began in Ketchikan on November 21, 1966. The series is being administered by the State Department of Labor under a Manpower Development and Training Act program. The courses are supervised by an extension educator in fisheries of the University of Alaska. Each course includes a practical training period aboard a west coast combination vessel to demonstrate trawling techniques. Personnel of BCF's Ketchikan Technological Laboratory have prepared lectures on fish handling and preservation.

* * *

HERRING CATCH IS LOWEST ON RECORD

Only 5,073 tons were taken in Southeastern Alaska in 1966, the smallest on record since 1941. Because the 1941 catch was only an experimental operation, the 1966 catch actually is the lowest recorded since 1929, when recordkeeping began. The catch per-unit effort during the 1966 season was slightly lower than the average: 0.31 ton per unit of effort compared with a 35-year average of 0.37 ton.



California

ANCHOVY LANDINGS TOTAL 5,200 TONS

About 5,200 tons of anchovy were landed through December 7, 1966, in the 1966-67 experimental anchovy reduction fishery, the Department of Fish and Game reported on December 9.

The experimental fishery, in its second year, was established with a maximum take of 75,000 tons. It opened October 1, 1966, and will close April 30, 1967. The DFG Director is authorized to close the fishery on 48 hours notice if it threatens the resource, or when the quota in any one of the five zones involved is reached.

* * *

CRAB POPULATION IS HEALTHY IN NORTH

The Department of Fish and Game's pre-season crab survey off northern California by the research vessel "N. B. Scofield" indicated that crab fishermen can expect good fishing through the 1966-67 season. Commercial-type crab traps were fished at 40 different locations between Crescent City and False Cape in 10 to 33 fathoms of water.

Landings were estimated to range between 6.8 and 8.9 million pounds at ports from Fort Bragg to Crescent City, slightly less than the 9.9 million pounds landed last season. Crabs were in better condition in 1966 than 1965. Only 7 percent of the legal male crabs still had soft shells; in 1965, 20 percent of the legal crabs had soft shells. Crabs aloswere larger: average weight was 2.4 pounds per crab, compared to 2 pounds in 1965.

* * *

1966 IS RECORD YEAR FOR FISH

Several fish and game records highlighted the annual report of Walter T. Shannon, Director, Department of Fish and Game, to the Fish and Game Commission on December 9, 1966:

- Fish hatchery production hit high in pound-age and number of fish produced. In fiscal 1965-66, 2,276,895 pounds (63,192,719 fish) were produced, including 27,325,996 trout and kokanee; 35,110,632 silver salmon, king salmon, and steelhead; and 56,091 warm-water fish.

- Both the commercial and sport catch of salmon increased. Commercial landings exceeded 10 million pounds, a near record, and were well above the 10-year average of 7.4 million pounds. In 1965, 9.7 million pounds were landed. Sport salmon landings of 114,000 fish nearly doubled 1965's 61,000 salmon.

- Shrimp landings of 1,230,000 pounds compared to 1965's 1,427,000 pounds. Market crab landings were more than 9½ million pounds, mostly in northern California. In the San Francisco Bay area, landings were under 50,000 pounds, a very low figure. The

California (Contd.):

crab fishery is not expected to improve in 1967. Investigations are underway to try to determine the reasons for the decline.

- "Population surveys indicate about 600 sea otters and 3,090 elephant seals, which means these species are holding their own," Shannon said.



Florida

SCIENTISTS CAN PREDICT EVERGLADES' WATER NEEDS

Fishery biologists at the Institute of Marine Science, University of Miami, have devised a system of predicting the fresh water requirements of aquatic plants and animals in Everglades National Park. Recent serious shortages of fresh water in the Park emphasized the urgent need for biological estimates of water requirements.

In the Park, where most of the priceless plant and animal communities are aquatic or semiaquatic, requests for supplementary fresh-water flow must be made on the basis of biological need. At stake are the multi-million dollar pink shrimp landings of the Dry Tortugas, Florida's most valuable fishery resource, other commercial fisheries, and the rapidly expanding sport fishery of Florida Bay and the 10,000 Islands. Most commercial and sport fishes and shrimps and crabs of the region spend critical months of their life cycle in the brackish water of the Park's estuaries.

The system of predicting biological water need is based on the recently discovered close relationship between ground water levels in the Shark River Valley and the position of lines of equal salinity, called "isohalines", in the coastal estuaries. By measuring ground water elevation above or below sea-level in any one of three wells in the watershed, it is possible to predict salinity in the estuaries throughout an 85-mile area along the south Florida coast--from the Keys to Everglades City. Companion studies have provided information on the kinds and quantities of plants in these coastal estuaries under different conditions of salinity. Thus, the height of water in the test wells warns when salinities are too high. It will tell

authorities when and how much water should be delivered to the park.



Maine

CANNED SARDINE STOCKS DROP

Through December 3, 1966, the year's pack of canned Maine sardines totaled 1,197,000 standard cases, according to the Maine Sardine Council. This compared with 1,227,000 cases packed during the same period in 1965. Bad weather during November was responsible for poor fishing conditions along the coast of Maine.

New legislation permitting year-round canning of Maine sardines removed the traditional December 1 closing date for the packing season. It opened winter canning to all Maine sardine packers--with domestic as well as imported herring.



Michigan

COHO ARE THRIVING

The 850,000 coho (Silver salmon) planted in spring 1966 in one Lake Superior stream and 2 Lake Michigan streams have made "amazing progress," reports the Department of Conservation. The young coho were raised in Michigan hatcheries and planted as 4- to 6-inch fingerlings. Within 3 months, several measuring more than 15 inches and weighing up to 2 pounds had been netted in Lake Michigan. The Department says the coho "promises to be one of Michigan's most outstanding fish."

The fall 1966 run was composed of 2-year-old fish--the "jacks" of the Pacific Coast. The majority of cohos planted in spring 1966 will either be caught in the Great Lakes in summer 1967, or will return in fall 1967 as full-fledged 3-year-old "adults."

Washington State Donates Chinook

The efforts to revitalize the Great Lakes fishery was aided by a Washington State donation to Michigan of more than 1,000,000

Michigan (Contd.):

chinook, or king salmon eggs. Fingerling chinooks hatched from these eggs will be planted in spring 1967 in a stream that has not yet been selected.



Oregon

DUNGENESS CRAB OUTLOOK IS GOOD

The Fish Commission reported an extremely good outlook for the 1966-67 Dungeness crab season. It opened December 1, 1966, and runs through August 15, 1967, in the Columbia River and Pacific Ocean. This season's harvest is expected to equal the 1965-66 catch of more than 10 million pounds. The average annual landings over the last 20 years has been 7 to 8 million pounds.

Due to the August 16-November 30 closed season, the crabs usually are abundant and in good shape by opening day.



Virginia

MENHADEN LANDINGS
NOT EXPECTED TO IMPROVE

The outlook for an improved catch of menhaden in the 1967 season is not good, reported Dr. Edwin B. Joseph, head of the Department of Ichthyology, Virginia Institute of Marine Science (VIMS), Gloucester Point, Va. "Although there has been some increase in our samples of young menhaden hatched out in 1965/66 winter season," he noted, "it has not been large, and reports coming to us from other investigations along the coast indicate that the 1966 production of young has been poor."

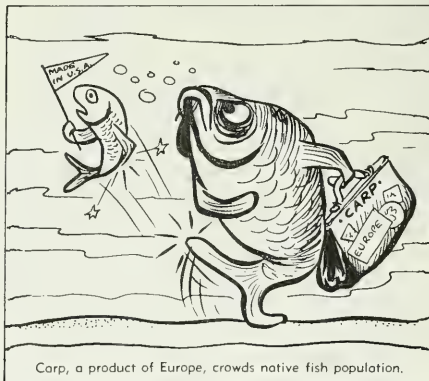
The Institute has been working to improve methods for predicting the abundance of menhaden a year or more in advance. Sampling the rivers and bay with a fine mesh net provides a measure of the relative abundance of young menhaden from year to year. It also supplies information about the probable fish population that will be available to purse seiners a year or more later.

Testing A Theory

VIMS's Department of Data Processing has intensively studied near-shore currents along the coast. A theory now being tested is that when a predominance of on-shore currents occurs during the breeding and larval season for menhaden, the largest numbers of young fish will appear in Chesapeake Bay--and the fishery will thrive a year later.

The "year classes" (young produced each year) have been weak for the past 4 years. The Chesapeake Bay fishery, which depends primarily on one-and two-year-old fish, now is operating on a short supply not likely to improve this year.

Institute scientists have been interested in locating other sources of fish which might be utilized for meal and oil when menhaden stocks are low. Under a BCF contract, a methodical study is being made of the variety and quantity of fish available in the Virginian Sea over the Continental Shelf at all seasons. It is possible that some species neglected by fishermen may be utilized by fish reduction plants when menhaden are inadequate.



BUREAU OF COMMERCIAL FISHERIES PROGRAMS

North Pacific Fisheries Explorations and Gear Development

"COBB" FINDS NO LARGE HAKE SCHOOLS

The "John N. Cobb" returned to Seattle October 14, 1966, after a 4-week exploratory hake fishing survey off the Washington coastline (Cruise 81). The primary purpose was to determine the distribution of schools of Pacific hake (*Merluccius productus*) while the Cobb worked along with the commercial hake vessels. Other objectives were to obtain biological data and more data on the hake's availability to the Cobb pelagic trawl.

Echo sounding transects were made throughout the area surveyed. When suitable tracings appeared on the echogram, they were fished with the Cobb pelagic trawl to determine species composition and abundance. The concentrations then were sounded out to determine their dimensions. This information was relayed to the commercial boats.

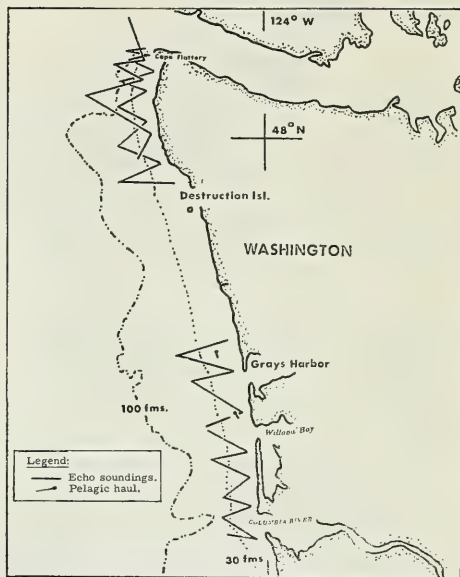
No large schools of hake were found. The five tracings observed on the sounder differed from those of previous cruises. They were not as compact nor as concentrated at any one depth. The first was located 18 miles west of Cape Beal, Vancouver Island; the second 25 miles west northwest of Cape Flattery; the third 15 miles west of La Push; the fourth 14 miles west southwest of Destruction Island, and the fifth $12\frac{1}{2}$ miles west of Cape Disappointment. The catches ranged from 2,000 to 15,800 pounds of hake per one-half hour haul; the total length of the hake ranged from 44 to 64 centimeters. Hake signs in the past were quite distinct and recognizable as hake, but during this cruise echograms believed to be hake turned out to be only large red jellyfish of the genus *Cyanea*. This animal usually causes a problem in the otter trawl and salmon trolling fisheries off the Washington coast. The species seemed quite abundant in summer 1966.

Note: For more information contact Base Director, BCF Exploratory Fishing and Gear Research Base, 2725 Montlake Blvd. E., Seattle, Wash. 98102.

* * *

"COBB" EXPLORES FOR ANCHOVY

The Cobb returned to Seattle November 18, 1966, after a 10-day exploratory anchovy



Area of exploratory anchovy survey of M/V John N. Cobb Cruise 82.

(*Engraulis mordax*) survey in coastal waters off Washington (Cruise 82). A major objective was to determine the catching efficiency of a modified Cobb pelagic trawl. A $\frac{2}{3}$ -scale model of the standard Cobb pelagic trawl with a mesh size of 2 inches and a full $\frac{1}{2}$ -inch mesh line in the codend was used. Sounding transects were made in 10-50 fathoms between the mouth of the Columbia River and Grays Harbor, and in 20-100 fathoms between Destruction Island and Cape Flattery. Signs of fish schools were very scarce. Some indications of fish concentrations occurred in the offing of Grays Harbor. Two sets made there yielded between 30-50 pounds of fish, of which only 8 pounds were small anchovies. Additional cruises will be made to determine whether or not commercial quantities of anchovy are available during the winter months.

Note: For more information contact Base Director, BCF Exploratory Fishing and Gear Research Base, 2725 Montlake Blvd. E., Seattle, Wash. 98102.



Gulf Fisheries Explorations and Gear Development

"BOWERS" TESTS ELECTRO-SHRIMP TRAWL SYSTEM

The M/V George M. Bowers tested the electro-shrimp trawl in the Tortugas shrimp grounds off southwest Florida October 20-November 12, 1966 (Cruise 69). The vessel was again rigged with two 40-foot Gulf of Mexico flat trawls. Again, the starboard trawl contained the electrical system and the port trawl contained a single tickler chain. The heads-on shrimp count was 41 and above, considerably smaller than the 35 and larger taken off the Texas and Mississippi coasts.

The tests resulted in some of the largest catches-per-drag yet accomplished with the electrical trawl. However, for the entire cruise, the electrical trawl averaged 50.1% of the night nonelectric trawl with weight averages of 18.9 lbs./hr., and 37.7 lbs./hr., respectively.

Catch results are arranged in three periods: Period I covers drags completed during good weather. Period II covers the results of drags during and immediately after a protracted stretch of bad weather. Period III results were obtained after the weather improved. During Period II, the catch average was 31%--compared to 51.7% for Period I and 58.9% for Period III--of the night conventional trawl catches.

Although the catch ratio was less than achieved off the Mississippi and Texas coasts, the shrimp catch in pounds during Periods I and III could be commercially acceptable. Expanded to two 40-foot trawls and 10 hours of fishing per day, the 19.5 lbs./hr. and 22.2 lbs./hr. would have produced better than 400 pounds of shrimp each day.

Note: For more information contact Base Director, BCF Exploratory Fishing and Gear Research Base, P.O. Drawer 1207, Pascagoula, Miss. 39567.



North Atlantic Fisheries Explorations and Gear Development

"DELAWARE" STUDIES DUTCH HERRING TRAWL

The M/V Delaware completed the third in a series of industrial fish exploratory cruises

on November 18, 1966 (Cruise 66-10). Its primary objectives were to perform gear trials with the Dutch Herring Trawl using headrope and wing transducers, and a strain gauge on a towing warp, while having the net rigged in a variety of ways; also, to determine relative abundance of industrial fish on the southeast part of Georges Bank, at depths over 100 fathoms in the channel between Georges and Browns Banks, and in deeper areas north of this channel. The vessel made 14 tows: the first 4 primarily gear trials, the remainder survey tows.

The net used for the gear trial and industrial fish survey phases was a Dutch Herring Trawl, which has a 63-foot headrope and 128-foot footrope. After the cruise, the staff of the Gloucester Base concluded that this trawl was not an effective net for bottom survey work due to its overall size, mesh size, and twine size--and that it should be limited to smooth bottom. Also, the net as rigged requires modifications--and that it may be more feasible for the staff to design a trawl more suitable for industrial fish surveys.

Some Results of Industrial Fish Survey

No commercial quantities of herring were found. In the greater fishing depths of the channel between Browns and Georges Banks, argentines (*Argentina silus*) were the predominant species caught. One tow gathered 4,000 pounds and other tows in this general area also produced proportionately high yields. "Taste tests" aboard vessel--and at the Technological Laboratory after cruise--show argentines are an unutilized food fish resource. As survey moved northward to areas west of German Bank and southeast of Mt. Desert Rock, tow results did not show industrial fish species.

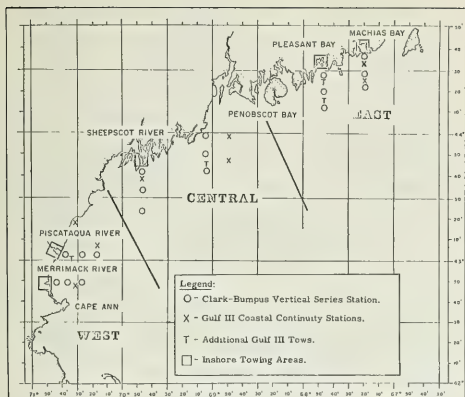
Note: For more information, contact Dr. John R. Thompson, Acting Base Director, EF&GR Base, State Fish Pier, Gloucester, Mass. 01930. Tel: 617-283-6554.



North Atlantic Fisheries Investigations

"RORQUAL" STUDIES ZOOPLANKTON DISTRIBUTION

The R/V Rorqual investigated the inshore-offshore and vertical distribution of zooplankton, with regard to hydrographic conditions, from Cape Ann to Machias Bay, October 9-17, 1966 (Cruise 7-66).



Area of investigations of R/V Rorqual Cruise 7-66.

The following are some preliminary findings: The average concentration of zooplankton along the coast, 1.4cc/100m³, was lower than in the preceding four autumn seasons. Average volumes decreased from west (3.0cc/100m³) to east (0.14cc/100m³). Copepods and cladocerans were the dominant zooplankters (89% of total). Of 14 copepod species in the samples, 4 dominated the catches--*Centropages typicus* (74% of the total), *Oithona similis* (9%), *Calanus finmarchicus* (6%), and *Temora longicornis* (3%). Dense patches of phytoplankton were encountered all along coast. Two dinoflagellate species, *Ceratium longipes* and *C. fusus*, occurred most frequently in samples and apparently were phytoplankters producing the autumn bloom encountered.

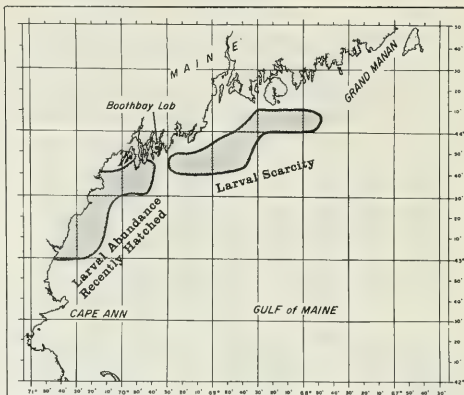
The samples had 1,442 larval fishes, 1,393 of them herring--ranging from 6.3 mm to 20.5 mm; average length was 9.0 mm.

Surface temperatures were seasonally normal, ranging from 8.7°C to 13.9°C. As in previous autumns, vertical mixing of water column increased from west to east.

"RORQUAL" ESTIMATES ABUNDANCE OF LARVAL HERRING

The purpose of the Rorqual cruise of October 17-27, 1966 (Cruise 8-66) was to estimate the abundance and vertical distribution of larval herring and their association with water types. The area of operation was

Cape Ann to Grand Manan Channel, from the headlands to the 50-fathom isobath (see chart).

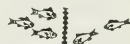


Approximate location of recently hatched larval herring (R/V Rorqual Cruise 8-66).

Two tows each were made at 46 stations with a Gulf III sampler. One tow was made at a station in Grand Manan Channel. The distribution of herring larvae above and below 20 meters was sampled at three stations. Surface temperatures and water samples for salinity determination were collected at each station. A hydrographic cast was made in Grand Manan Channel.

The chart shows the approximate location of a large group of recently hatched larval herring. Also notable was an area of larval scarcity. No large concentrations of fish were detected on the echo sounder.

Note: For more information, contact BCF Biological Laboratory, W. Boothbay Harbor, Maine 04575.



Central Pacific Fisheries Investigations

SONAR STUDIES OF PELAGIC FISH

Skipjack tuna are one of the large under-harvested resources in the Pacific Ocean. They spend most of their lives in the central Pacific--away from the Americas and Asia. To harvest them in their vast ocean domain, it is necessary to know how they are distributed in the sea.

To help answer this and other questions about increasing the harvest of skipjack and

other high-sea fishes, a continuous-transmission, frequency-modulated sonar was installed on the research vessel "Townsend Cromwell" in spring 1966. During the summer, scientists of BCF's Biological Laboratory in Honolulu obtained information on the sonar's effective range, its ability to determine depth and movement of fish, and the likelihood that sonar targets can be specifically identified.

Before sonar, direct observations of tuna from underwater viewing ports had been limited to only 20 yards because the fish blended with their background. With sonar, a single skipjack $1\frac{1}{4}$ feet long, hung beneath a buoy, could be observed from 258 yards; schools of skipjack usually could be observed as far as 220 to 440--and, on occasion, from 715 yards. Maximum sonar range varied considerably among schools because of different fish sizes and wave heights. The maximum sonar range achieved was 880 yards on a group of porpoise.

Sonar Searches Rapidly

The sonar has high resolution and a high information rate. It can rapidly search a complete underwater hemisphere. The high resolution makes it possible to determine accurately the relation of fish to ship. The high information rate makes it possible to update the fish's position as often as every 30 seconds. So, along with depth information, the biologists also obtained data on the fish's swimming speed and course over short periods. For example, an unidentified subsurface target was found swimming at 2 knots at 27 fathoms. It was tracked as it surfaced, turned, and swam to the ship, where it was identified--a 5-foot whitetip shark.

Some of the most interesting information from these first cruises dealt with depth distribution of subsurface targets in the upper 220 fathoms. One day, most targets were in the upper 6 fathoms, but a second concentration was at 30 fathoms, and a third at 74. The 6-fathom and 30-fathom targets were in the mixed layer (80° F.); the deepest targets in the thermocline were at 69° F. On another day, a mixed group of skipjack and yellowfin tunas was identified at the surface and tracked to 77 fathoms.

If biological targets could be identified to species from sonar data alone, sonar would be an even more powerful tool--especially

in assessing oceanic populations. Already, porpoise targets can be distinguished from fish targets. This distinction was achieved easily because porpoise sounds are clearly discernible on sonar. Differences in strength, size, shape, speed, and depth of fish targets suggest eventual success in distinguishing fish species.

Note: For more information, contact Area Director, BCF, P.O. Box 3830, Honolulu, Hawaii 96812.



Alaska Fisheries Explorations and Gear Development

"MANNING" SURVEYS SHRIMP

The John R. Manning returned to Juneau, Alaska, on November 22, 1966, after completing the first leg of the fall 1966 shrimp survey off Southeastern Alaska. Best catches (240 pounds) of coonstripe shrimp occurred in Charpentier Inlet, inside Glacier Bay. Best catches of spot shrimp (63 pounds) were made in Port Frederick; largest shrimp collected were 11-count spots. The relative fishing efficiency of both the 2- and 3-inch conical tunnel shrimp pots was significantly higher than igloo and ramp-style shrimp pots. Repeated tows with a roller-rigged shrimp trawl showed a significant reduction of debris, rocks, crabs, etc. in the trawl's cod-end.

The Manning departed Juneau on November 27, 1966, to begin the second leg of the survey.



Aerial Photos Reveal Surface Schools in Gulf of Mexico

In early December 1966, the first in a series of aerial surveys of surface-school fishes in the Gulf of Mexico was carried out from BCF's Pascagoula Exploratory Fishing Base. Color and infrared photos were taken of schools between Mobile Bay and Panama City, Florida. About 150 fish schools were sighted along the 40-mile stretch from Mobile Bay to Pensacola and 200 more schools between the latter and Panama City. Most schools were believed to be menhaden. Experimental fishing operations will coincide with future flights to substantiate aerial ob-

servations. They will also obtain preliminary information on possible methods for taking these offshore stocks.



Participation in Paris Fair is Success

BCF's International Trade Promotion Office carried out a successful mission to the Paris International Trade Fair during November 11-21, 1966. Thirteen U. S. fishery firms supplied fresh, frozen, and canned fishery products for the Salon de l'Alimentation fair. Actual sales of king crab meat, shrimp, and frozen lobsters totaled \$120,000. The U. S. industry sees potential sales of \$1,200,000 for the 12 months following the fair. Inquiries were made by importers from Spain, Italy, Belgium, Luxembourg, Germany, Martinique, Algeria, etc.

Maine lobsters, frozen by a liquid nitrogen process, were displayed for the first time and won orders. Several importers would like to negotiate an exclusive agreement with the Maine processor.



Ketchikan Lab Holds Workshop for Fishermen

More than 70 fishermen, processors, and interested citizens recently came to the Fishery Technological Laboratory in Ketchikan to talk about fishing for Alaska prawns. The BCF Exploratory Fishing and Gear Research Unit displayed various types of shrimp pots and methods of rigging them. The Alaska Region's gear experts discussed gear problems, the results of exploratory fishing and plans for future work. Technologists talked about methods of optimum handling and processing aboard vessels.

The workshop began with brief talks. Later, the group moved to the Bureau's warehouse to examine trap types, their construction, rigging, and fishing methods. Fishermen had been invited to bring their favorite traps for comparison.



Dr. Galtsoff Receives Award for Book on Oysters

Dr. Paul S. Galtsoff, a Government scientist who dedicated 40 years to shellfish research, was awarded \$2,500 by BCF on December 9, 1966, for writing "The American Oyster" in 1964. Dr. Galtsoff wrote the 480-page reference for biologists, State administrators of oyster resources, public health officers, students of marine biology, and oyster growers. BCF Acting Director Harold E. Crowther said the book "will stand for a long time as one of the most comprehensive studies ever made of a marine animal. It climaxed an outstanding scientific career in the Federal Government."



Dr. Galtsoff receiving award. From left to right: Dr. Herbert W. Graham, Dr. Paul S. Galtsoff, and John T. Charrett.
(Photo: Robert K. Brigham)

"The American Oyster" costs \$2.75 and is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.



BLUEFIN TUNA TAGGED IN JAPAN CAUGHT OFF BAJA CALIFORNIA

A bluefin tuna tagged and released by Japan August 27, 1965, was captured off Baja California July 15, 1966, by the United States purse seiner Jo Linda. It is the first Japanese-tagged bluefin recovered in that area, according to California's Department of Fish and Game. The fish, 36 centimeters (14 inches) when released had grown to 68 centimeters (27 inches) during 323 days of liberty. It was estimated that the bluefin traveled at least 5,000 miles.

Note: See Commercial Fisheries Review, Dec. 1964 p. 62.

FEDERAL ACTIONS

Department of Commerce

EDA APPROVES GLOUCESTER FISHING INDUSTRY STUDY

The Economic Development Administration will finance a study that may open more jobs in the fishing industry of the Gloucester, Massachusetts, area. The study will determine whether a program similar to the agricultural extension service will benefit fishermen, fish processors, and allied trades in the Gloucester-Rockport-Essex area.

The 2-year project will cost \$47,539. EDA has approved \$43,543 for the technical assistance project and the Gloucester Fisheries Commission will contribute services worth nearly \$4 thousand.

The demonstration project will try to strengthen the industry by distributing information to vessel operators and processors on the latest developments in fishing and processing methods; explaining government assistance programs and advising government agencies on industry problems; improving the industry's competitive position with other industries; conducting on-the-job training programs to supply trained fishermen to the area's fishing fleet.

BCF reviewed and recommended approval of the project. It will monitor the study and make periodic reports to EDA.

* * *

PLAN CENSUS OF FISHING VESSELS

The Bureau of the Census and BCF are co-operating in preparing a census of commercial fishing vessels for 1967. Information on quantity and value of landings by species and area will be obtained for all U. S. vessels. These data will complement and serve as benchmarks for the annual data collected by BCF's Branch of Fishery Statistics. The census takers will also seek such information as landings in foreign countries.



Department of the Interior

ADVISES ON MILITARY'S FISH PURCHASES

At the suggestion of the President's Council of Economic Advisors, the Departments of Defense (DOD), Agriculture, and Interior are cooperating in the military procurement of food. Large military food purchases have produced much pressure in some markets. To minimize this, DOD will use the current economic analysis of fishery and agricultural products by Interior and Agriculture to prepare annual food plans and menus, and in the food procurement program. This approach will help move abundant commodities and may prevent large price rises in scarce commodities.

* * *

FINANCIAL ASSISTANCE PROGRAMS MARK TIME UNTIL NEW FUNDS GRANTED

Fishing Vessel Construction Differential Subsidy Program: Under this BCF-administered program, more subsidy applications were received and approved in 1966 than in any year since the program began in 1960. As a result, the Bureau does not have sufficient funds available to complete the processing of all applications now ready for final action leading to vessel construction. Processing of additional applications necessarily will be delayed until additional funds become available.

Fishing Vessel Mortgage Insurance Program: More and larger applications also have been received by the Bureau for mortgage insurance. Currently, the amount of active applications on hand exceeds the amount BCF is authorized to insure. No further applications for mortgage insurance will be accepted because a nonreturnable filing fee is required with each application. Appropriate notice will be given when BCF again is in a position to accept applications.

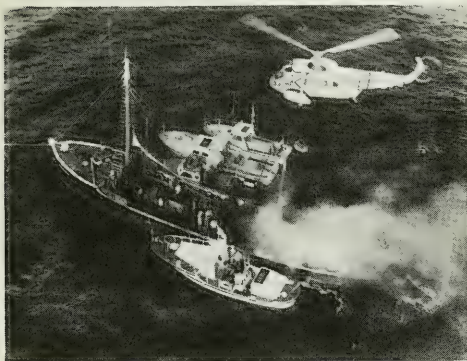


Treasury Department

COAST GUARD SAILS FROM TREASURY TO NEW TRANSPORTATION DEPARTMENT

The Coast Guard will be transferred in the next few months from the Treasury Department to the new Department of Transportation, opening a new era for the 176-year-old agency.

The Coast Guard (CG) is an Armed Force, but its primary peacetime mission is to protect life and property at sea. It took on this role in the early 1830s when revenue cutters were directed to conduct winter cruises to aid distressed vessels. In 1966, the CG answered 43,466 calls for help and saved more than 3,400 lives. Of equal importance with search and rescue is its accident prevention function designed to prevent disasters at sea. In 1966, the CG inspected 4,743 U. S. vessels of 11,599,942 tons, and 1,544 foreign vessels of 14,887,164 tons.



COAST GUARD AT WORK: In September 1966, the Coast Guard answered a call for help from the burning fishing trawler "Cara Cara" off the Massachusetts coast. Four of the USCG boats are shown clustered around the trawler. An HH-52A amphibious helicopter lowers a basket with additional fire-fighting equipment. All 7 crewmen were safely removed to one boat. After the flames were put out, a second USCG craft towed the Cara Cara to Scituate, Mass.

(Photo: U. S. Coast Guard)

A Century of Oceanography

The Coast Guard carried out its first oceanographic mission in 1867 when the revenue cutter "Lincoln" explored the waters of the Alaskan Territory shortly after its purchase from Russia. Since then, the CG's Alaskan Patrol, ocean station vessels in the Atlantic and Pacific, and the International Ice Patrol have helped expand understanding of the sea. In 1961, legislation gave the CG official oceanographic status. The cutter "Northwind" has carried out investigations of the Kara and Barents Seas north of the USSR. Larger vessels are being equipped with the latest instruments to permit more effective work. The new 378-foot cutter "Hamilton," scheduled to be commissioned early this year, will have fully equipped wet and dry oceanographic laboratories and a computer. The CG makes available information it obtains to oceanographic centers around the world. In 1966, a Marine Sciences Division was set up at CG headquarters with full jurisdiction over the agency's efforts.

On December 15, 1966, the CG acquired the last of the U. S. Navy's deep-draft ice-breaking fleet, the "Burton Island," and became the chief U. S. icebreaking agency. The icebreakers will support the Navy's polar operations.

The Coast Guard has constructed a chain of Loran-C stations off Thailand and South Viet Nam to provide southeast Asia with a system of electronic navigational aids. Loran (Long Range Aid to Navigation) was developed by the Coast Guard early in World War II. The Loran network now circles the world.

The Coast Guard also is replacing the picturesque old lightships with modern offshore structures. In 1966, it commissioned the building of one at Diamond Shoals, about 12 miles southeast of Cape Hatteras, North Carolina. And, in the entrance to New York Harbor, an offshore structure at Ambrose Station will replace the lightship.



INTERNATIONAL

Food and Agriculture Organization

COUNCIL HOLDS 47th SESSION

The 47th Session of the Food and Agriculture Organization (FAO) Council was held in Rome in October 1966. FAO is the specialized agency of the United Nations concerned with raising world nutritional levels and securing efficiency of food production and distribution. The FAO Council is an executive organ composed of 30 member nations, including the United States.

The Council was generally satisfied with the program of FAO's Department of Fisheries and its growth, provided for by the 13th Session of the FAO conference. Several developing countries appealed for more technical assistance in the field and for more FAO subregional offices. Delegates also suggested the need for more work on fisheries training, resource assessment, more and better statistics, marketing surveys, preinvestment studies, and improved liaison with international organizations.

At a ceremony in the FAO Director-General's office, the Japanese Ambassador to Italy signed the International Convention for the Conservation of Atlantic Tuna. At the Council Meeting, 9 nations indicated support of the Convention and said they intended to ratify it (seven ratifications are needed to place the Convention into force).

The next FAO Council Session will be held in Rome, June 12-23, 1967.

* * *

INDO-PACIFIC COUNCIL SEEKS TO IMPROVE MARINE FOOD RESOURCES

The Indo-Pacific Fisheries Council of the UN's FAO met in Honolulu, October 3-17, 1966, and worked on a program to improve marine food resources for Southeast Asia. President Johnson has called better use of the sea's resources "one of the most consequential items on the agenda of mankind."

A 2-day symposium on fisheries education and training was devoted in part to papers describing training programs throughout the world. One result was the recommendation

that one or more educational centers be established in the Indo-Pacific region to train extension officers, who could then train fishermen directly. These officers would also provide member nations with training information and advice.

The Council appointed a committee, scheduled to meet in Rome in October, to discuss the programming and coordination of investigations of the Indian Ocean's fishery resources. The Council also considered Hawaii's needs for new fish species to enrich its fauna and suggested several kinds that might be introduced there. And, it decided to promote the preparation of a multilingual manual to identify commercially important species of the Indo-Pacific region. The manual will consist of cards--carrying pictures and local names of fishes--which can be used by fishery officers and fish dealers. The use of cards will enable collection of more reliable statistics.

The Council has 18 member nations. U. S. delegate was John C. Marr, Area Director, BCF, Hawaii. His alternate was John A. Dasow, BCF, Seattle.



ICES Holds 54th Annual Meeting

The International Council for the Exploration of the Sea (ICES) held its 54th Annual Meeting in Copenhagen, Sept. 30-Oct. 12, 1966. ICES acts as scientific advisor to the North-East Atlantic Fisheries Commission.

The Comparative Fishing Committee discussed topside chafing gear, in double-mesh size, it was found to affect selectivity only slightly--a finding shared by the ICNAF Subcommittee on Gear and Selectivity. Several speakers indicated that fishing captains in some countries were reluctant to use this type of chafing gear because it does not prevent large catches from bursting the cod end. The Committee recommended additional research on the problem.

The Herring Committee reviewed the great increase in exploitation of northern North Sea herring stocks. It agreed that a 5- to 30-percent reduction from the 1965 catch

(more than 900,000 metric tons) was desirable. Ad hoc groups were formed to plan further resource studies using acoustic methods, tagging, and more extensive larval surveys.

The next annual meeting will be held in Hamburg, Germany, during early October 1967. (U. S. Embassy, Copenhagen, October 23, 1966.)



United Nations Approves Marine Resources Resolution

A resolution on the sea's resources, approved by a committee of the United Nations General Assembly, November 9, 1966, calls on the Secretary-General to initiate a comprehensive survey of activities in marine science and technology undertaken by members of UN organizations, member states, and intergovernmental groups.

The Secretary-General also is invited to formulate proposals to expand cooperation in learning more about the marine environment through science and the exploitation and development of marine resources. The resolution recommends that due regard be given the preservation of fish stocks and that marine education and training programs be strengthened.

The Secretary-General is asked to submit his proposals to the General Assembly at its 23rd session in 1968.



International North Pacific Fisheries Commission

HOLDS ANNUAL MEETING
IN VANCOUVER

After reviewing salmon, halibut, king crab, and groundfish resources in the North Pacific, the International North Pacific Fisheries Commission concluded its 13th annual meeting in Vancouver, British Columbia, on November 11, 1966.

The Commission operates under the International Convention for the High Seas Fisheries of the North Pacific Ocean, signed by Canada, Japan, and the United States in 1952. The Convention provides several kinds of action to promote conservation and proper use of the sea's resources. Where resources are exploited by fishermen of 2 or more member countries, the Commission studies the need for conservation measures as indicated by scientific research; if such measures are necessary, it recommends their inclusion in the domestic fishing regulations of each country. Where the Convention characterizes certain resources as being fully exploited and under effective conservation management, it provides that member countries refrain from fishing these resources if they have not previously done so. Under this provision, Canada abstains from exploiting salmon of the Bristol Bay area of Alaska; Japan does not fish for salmon in the eastern North Pacific and Bering Sea, halibut in the northeastern Pacific south of the Aleutian Islands and the Alaska Peninsula, and herring off most parts of the British Columbia coast. The Commission recommended no changes in these provisions.

Recommendations for 1967

One principal task on the agenda was to recommend fishing regulations for the halibut fishery of the eastern Bering Sea in 1967. The Commission has done this since 1963, when line fishing in that area first became open to the 3 countries. For 1967, the Commission agreed to recommend a slight lengthening of the fishing season in the focal part of the fishing ground, referred to as Area A, and intensified conservation measures for areas east and west of it. It will recommend that an extensive area in the southeastern Bering Sea--a nursery ground for young halibut--be closed to fishing completely and, within part of this area, Japan will undertake to prohibit all trawl fishing by its vessels. Canadian and U. S. representatives said their governments intend to require fishermen to release all halibut taken by trawl nets in any part of the Bering Sea. The Japanese delegates said their government intends to apply a minimum size limit of 66 centimeters (26 inches) for halibut to Japanese fishing operations throughout the Bering Sea.

In the Gulf of Alaska, the Commission's studies focused on effects of the expanding

trawl fisheries for various species of bottom-fish and shrimp on the halibut stocks, which are exploited by Canadian and United States set-line fishermen. Groundfish catch statistics were exchanged. Scientists studied reports on numbers of halibut found in bottom-fish trawl catches. The Commission approved recommendations by its Gulf of Alaska Groundfish Committee for further research in this field.

After considering king crab research, the Commission recommended that research on this species in the eastern Bering Sea be continued and strengthened.

The Commission noted reports that South Korea may enter the salmon, and perhaps other, fisheries in the Convention-covered area. It requested the Commission's chairman to call these reports to the attention of member governments, express the Commission's grave concern over the implications of such an action on its conservation program, and to ask the member governments to consider the matter.

The next annual meeting was scheduled for Tokyo, beginning November 6, 1967.



U. S. and Japan Renew King Crab Agreement

On November 18, 1966, the United States and Japanese delegations successfully concluded consultations in Washington on the Japanese king crab fishery in the eastern Bering Sea. The negotiations began November 14. The delegations agreed to recommend to their respective Governments extension for another two years of the agreement of November 1964. There is a single exception: the annual Japanese king crab catch for 1967 and 1968 would be set at the equivalent of 163,000 cases to avoid possible overfishing. The Japanese catch for 1965 and 1966 was the equivalent of 185,000 cases. The delegations also agreed to recommend further intensification of the study and research of the king crab resource in the eastern Bering Sea and presentation of the results to the International Commission under the North Pacific Fishery Convention.

The United States delegation was headed by Ambassador Donald L. McKernan, Special Assistant for Fisheries and Wildlife to the Secretary of State; the Japanese delegation was headed by Minister Ryojo Sunobe of the Embassy of Japan in Washington.



U.S. and USSR Hold Talks in Moscow

United States and Soviet fishery experts completed 10 days of talks on November 25, 1966, in Moscow, preparatory to a later meeting in Washington, D. C. Scientists assessed the condition of certain fish stocks exploited by Soviet and U. S. fishermen in the Pacific Ocean, primarily off the Oregon and Washington coasts, and in the Atlantic Ocean off the mid-Atlantic States. The talks also dealt with navigational and other technical problems caused by the appearance on the fishing grounds of many different-sized vessels using differing fishing tactics. The participants identified several categories of technical and navigational problems and various possible means for dealing with them.

The U. S. group was led by William M. Terry, BCF's Assistant Director for International Affairs. The Soviet group was headed by Peter A. Moiseyev, Deputy Director of the Soviet All-Union Institute of Marine Fisheries and Oceanography.



Fish Meal

WORLD PRODUCTION ROSE 23% IN JANUARY-OCTOBER 1966

The world's production of fish meal in the first 10 months of 1966 increased about 23 percent over the same period of 1965. Output in 1966 was up sharply in Peru, Chile, and Norway. U. S. output was down.

Most of the principal producing countries submit data monthly to the International Association of Fish Meal Manufacturers (IAFMM) (see table).

World Fish Meal Production by Countries, October 1966 with Comparisons				
Country	Oct.		Jan.-Oct.	
	1966	1965	1966	1965
	.....(Metric Tons).....			
Canada.....	4,056	7,404	74,568	72,203
Denmark.....	11,564	12,578	94,902	103,683
France.....	1,100	1,100	11,000	11,000
German Fed. Repub.	6,543	6,190	61,750	57,404
Netherlands.....	1/	505	2/1,510	4,884
Spain.....	1/	1/	1/	3/13,247
Sweden.....	902	788	4,766	6,089
United Kingdom.....	7,249	6,633	73,559	66,669
United States.....	9,834	11,175	151,684	199,954
Angola.....	1/	6,343	4/ 36,211	35,362
Iceland.....	21,266	14,734	142,755	120,436
Norway.....	45,386	32,021	401,090	285,680
Peru.....	175,711	41,463	1,280,822	951,553
So. Afr. (including S.-W. Afr.).....	6,690	6,375	251,911	267,824
Belgium.....	375	375	3,750	3,750
Chile.....	5,067	885	189,200	52,581
Morocco.....	1/	3,150	4/ 21,300	16,050
Total.....	295,743	151,619	2,799,778	2,268,369
1/Data not available. 2/Data available only for January-April 1966. 3/Data available only for January-May 1965. 4/Data available only for January-September 1966. Note: Japan does not report fish meal production to the International Association of Fish Meal Manufacturers.				

FEO PRODUCTION AND EXPORTS, JANUARY-AUGUST 1966

The member countries of the Fish Meal Exporters' Organization (FEO) account for about 90 percent of world exports of fish meal. The FEO countries are Chile, Angola, Iceland, Norway, Peru, and South Africa/South-West Africa.

FEO Exports of Fish Meal, January-August 1966				
Country	August		Jan.-Aug.	
	1966	1965	1966	1965
	.....(1,000 Metric Tons).....			
Chile.....	15.9	4.7	132.9	56.0
Angola.....	1/	2.9	2/27.9	30.1
Iceland.....	17.4	16.2	98.7	90.5
Norway.....	26.2	30.3	155.7	147.5
Peru.....	87.0	46.6	945.3	1,076.1
So. Africa (including S.-W. Africa).....	12.6	22.1	102.3	154.8
Total.....	159.1	122.8	1,462.8	1,545.0
1/Data not available. 2/Data available only for January-July 1966.				



Atlantic Tuna Convention Signed by 5 Nations

A convention to conserve the resources of tuna and tunalike fish of the Atlantic Ocean is receiving international recognition. On October 28, 1966, Japan became the fifth country to sign the Convention, following Brazil, Spain, South Korea, and the United States. It will come into force when 7 nations have ratified or otherwise approved it.

The convention was drafted at a 17-nation conference in Brazil, May 1966. It grew out of fears that Atlantic tuna were being overfished and that stocks might be damaged if the present fishing rate was maintained. The convention provides for the creation of an international commission to collect, analyze, and publish statistical information and recommend levels that will permit the maximum sustainable catch. (Food and Agriculture Organization, Rome.)



Studies Antarctica's Palmer Peninsula

A U.S. scientist is accompanying a British expedition supplying bases in the Antarctic during the short summer between December 1966 and March 1967. His assignment is part of an international program of peaceful scientific cooperation between the 12 signatory nations of the 1959 Antarctic Treaty. Each country invites scientific personnel from other nations to accompany such expeditions.

The scientist, Theodore R. Merrell Jr., supervisor of the Alaska Federal research programs on pink and chum salmon, has been with BCF's Auke Bay (Alaska) Laboratory for 10 years. He was chosen by the National Scientific Foundation. Merrell will evaluate the Palmer Peninsula area for fisheries and oceanography research by the U. S.

The Palmer Peninsula

The Palmer Peninsula is a mountainous peninsula several hundred miles long extending toward the tip of South America. It was named for the captain of a U. S. fur sealing ship who discovered the Antarctic Continent in 1820. The peninsula is on the opposite side of the "White Continent" from the major U.S. research bases. It has several United Kingdom, Chilean, and Argentinian year-round bases. Seals, sea birds, and fish are abundant. Whales were also numerous until recent years, but overkilling has nearly exterminated them.

FOREIGN

CANADA

EAST COAST PLANS FISH MEAL DEVELOPMENT

Two 125-foot seining vessels from Norway, scheduled to arrive in November 1966, will train Newfoundland fishermen around Stephenville. A new fish meal plant is to be established there, reportedly with help from two United States firms. According to a Newfoundland engineering firm, the Norwegian seiners "Stella Kristina" and "Stella Maria" will employ 25-man crews. There is cargo space for 350 tons of fish below deck and 50 tons on deck. The vessels will use seine nets measuring 227 fathoms by 92 fathoms for fishing in depths up to 120 fathoms off Newfoundland. (U. S. Consul, St. John's, Oct. 20, 1966.)

The Canadian Government believes the East Coast herring resource can support a much larger fish meal industry. Herring catches up to 150 tons a set were taken in the Gulf of St. Lawrence in summer 1966 by the 80-foot "Western Ranger" (from British Columbia) chartered by the New Brunswick Department of Fisheries.

WILL NOT LIMIT PACIFIC SALMON FISHING LICENSES IN 1967

Licenses to engage in the British Columbia salmon fishery in 1967 will be issued to any Canadian citizens applying before the deadline date of May 31, 1967.

The Canadian Government had proposed earlier that such licenses be issued only for vessels licensed to fish salmon in 1966, or which replaced such vessels. However, unforeseen difficulties require that more detailed discussions than anticipated be held with fishermen and industry in British Columbia. (Canadian Department of Fisheries, Vancouver, Oct. 28, 1966.)

SUBSIDIZES DOGFISH SHARK PROCESSING

To encourage the production and marketing of dogfish shark products, the Canadian

Government announced on October 28, 1966, its readiness to assist by paying fishing companies 11 Canadian cents a pound on the production of up to 225,000 pounds of skinned dogfish flaps. This represents about 1,100 tons of whole dogfish.

The program continues the experimental marketing program started a year ago. At that time, it gave promise of expanding and providing a regular market in Europe for dogfish products. Companies participating in this program must provide the Department of Fisheries with a record of all costs associated with the program and reimburse fishermen at specified minimum costs.

It is recognized that the market for dogfish carcasses is limited. Under the new assistance program, companies can choose between purchasing round, fresh, dogfish direct from fishermen and producing flaps, carcasses, and livers -- or buying unskinned flaps from fishermen and producing only skinned flaps. In the latter, livers from dogfish can be sold through the fishing company or directly by fishermen to domestic buyers.

The Canadian Government wants to help reduce the large dogfish population that has become a problem to commercial and sport fishing on the Pacific Coast. At the same time, the program may encourage new markets. This could possibly develop into an operation that could sustain a dogfish operation without Government assistance. (Canadian Department of Fisheries, Vancouver, October 28, 1966.)

REPORT PROPOSES FRESH-WATER FISH EXPORTS BE CONTROLLED

A report by a Commission of Inquiry recommends that a freshwater fish marketing board be set up to handle all export and inter-provincial sales of freshwater fish in North-western Ontario, Manitoba, Saskatchewan, Alberta, and the Northwest Territories.

The report proposes that the board be the sole buyer of freshwater fish from Canadian fishermen, but that services of present exporters, packers, and processors be utilized under contract with the board.

Canada (Contd.):

The report is being studied by the Federal Government, which will consult Provincial Governments and trade representatives before it decides on the report's recommendations.

The Commission was set up in 1965 following recommendations of a Federal-Provincial Prairie Fisheries Committee that studied instability of prices and demand in freshwater fisheries products and more efficient marketing means to improve returns to primary producers. (Canadian Department of Trade and Commerce, Ottawa, Oct. 17, 1966.)

* * *

TESTS SCOTTISH SEINE VESSEL IN HERRING FISHERY

The "Guiding Star," a 70-foot wooden vessel powered by a 152-horsepower diesel engine, has crossed the Atlantic from Aberdeen, Scotland, to Newfoundland. She is under a one-year charter to the Industrial Development Service of the Canadian Federal Department of Fisheries to determine whether Scottish seine netting can be adopted profitably by the herring industry. The Guiding Star will engage in full-scale commercial fishing. She also will undertake exploration.

A Scottish crew of seven will operate the vessel from ports in Newfoundland and later move to Nova Scotia, New Brunswick, Prince Edward Island, and Quebec. (Canadian Department of Fisheries, Ottawa, Oct. 6, 1966.)

* * *

TO BUILD MULTIPURPOSE PATROL-RESEARCH VESSEL FOR PACIFIC

Canada has awarded a contract for the construction of a multipurpose Department of Fisheries patrol vessel. Costing \$2.8 million, it will be delivered in mid-1968.

The 180-foot steel vessel will be the largest and most versatile craft of the Department's protection fleet of 40 vessels on the Pacific coast. Besides regular patrol duties, she will be equipped for experimental fishing, oceanographic and biological research, and search and rescue activities. Her cruising range of several thousand miles will per-

mit patrols to and from the Bering Sea without refueling. (Canadian Department of Fisheries, Ottawa, Nov. 23, 1966.)

* * *

CONDUCTS EXPLORATORY SHRIMP TRAWLING OFF BRITISH COLUMBIA

A 70-day shrimp trawling survey in Hecate Strait and Queen Charlotte Sound with the "Belina" was carried out by the Nanaimo Biological Station of the Canadian Fisheries Research Board.

Even before final assessment of the results were made, the scientists agreed that only one or two spots have commercial possibilities. In scores of net tows, the best showing of shrimp was found off Milbanke Sound, near the northeast corner of Goose Island fishing grounds. That is in the general area from Cape Mark to Currie Island. Of the 22 tows made there, to depths down to 700 feet, the best yielded more than 550 pounds. The average catch of all tows in that area was about 135 pounds.

Interesting prospects were found in Laredo Sound. Nine tows were completed from Kitasu Bay to Moody Banks. In one tow off Lombard Point, 182 pounds of shrimp were landed. The average tow yielded 89 pounds. (Canadian Department of Fisheries, Vancouver, Nov. 23, 1966.)

* * *

STUDIES FISHERIES TRAINING IN USSR, NORWAY, AND BRITAIN

A group of Federal and Provincial officials engaged in fisheries vocational training was scheduled to arrive in Moscow November 23, 1966, to begin a 2-week study of Soviet fisheries training methods. The Canadian group will then visit Norway and Britain. The tour resulted from a proposal made by the Canadian Federal-Provincial Atlantic Fisheries Committee.

Under a reciprocal arrangement, a group of Soviet fisheries officials will visit Canada early this year to study Canadian training methods. (Canadian Department of Fisheries, Ottawa, Nov. 18, 1966.)

* * *

Canada (Contd.):

SECOND JOINT JAPANESE-CANADIAN WHALING COMPANY FORMED

Taiyo Fishing Company of Japan and the Canadian Fishery Products Company were scheduled to establish in mid-December 1966 a joint whaling venture in Newfoundland with a capital investment of \$100,000. To be named "Atlantic Whaling Company," the joint company will conduct whaling operations with Taiyo's catcher vessel "Fumi Maru No. 15" (471 gross tons). Catch target for 1967 whaling season (June-September) was set at 175 blue whales.

Earlier in 1966, a Japanese fishing firm, Kyokuyo Hoge, sent its whaling vessel "Kyo Maru No. 17" (754 gross tons) to Newfoundland on an exploratory trip, with plans to enter into a joint venture with Canadian interests. (Minato Shimbun, November 27, 1966.)

EXPANDS EAST COAST HERRING EXPLORATIONS

The recently built British Columbia herring purse-seine vessel "Western King" arrived at Harbour Breton, Newfoundland, in early December 1966 and began exploratory fishing for herring and capelin. She made the trip via the Panama Canal.

The 90-foot vessel is under charter until summer 1967 to the Industrial Development Service of the Canadian Federal Department of Fisheries. The main purpose is to obtain information on offshore stocks in the rapidly expanding herring fishery of the Northwest Atlantic. Canada previously explored for herring in inshore waters. The vessel also will carry out exploratory fishing for capelin and similar species off Newfoundland and Nova Scotia and in the Gulf of St. Lawrence. Another purpose is to demonstrate modern purse-seining techniques and shipboard fish-handling methods.

The vessel is commanded by an experienced British Columbia skipper who fished successfully earlier this year in the Gulf of St. Lawrence. The crew, which includes Newfoundland fishermen will also try to determine the feasibility of developing a year-round, deep-sea capelin fishery.

At the request of Newfoundland fisheries authorities, the Western King began exploratory fishing operations in Placentia and St. Mary's Bays for the benefit of inshore fishermen.

One shipboard technique to be used is holding herring and capelin in refrigerated sea water, a method developed by Federal fisheries technologists and used to some extent on the Pacific coast. (Canadian Department of Fisheries, Ottawa, Dec. 8, 1966.)



FISHING BY HELICOPTER IN NEW ZEALAND

A helicopter is the latest tool for commercial fishermen in New Zealand. A new company plans to use the helicopter to set as many as 50 miles of fishing line and 50,000 hooks in the water each day. Nets and crayfish pots will also be laid. The haul of fish will be carried in nets slung under the helicopter.

Lines laid close to shore will be pulled in by jeep, while those farther out will be retrieved by a man in a small boat.

To protect their catch, the aircraft will be armed with harpoons to shoot sharks. (Reprinted, with permission from Science News, weekly summary of current science, c 1966 by Science Service, Inc.)

LATIN AMERICA

Peru

REPORT ON FISH MEAL AND OIL

Peru is the world's leading fishing nation in tonnage landed and its position is owed to the anchovy--the most important commercial fish in Peruvian waters and the principal source of fish meal and fish oil.

The relatively new fish-meal industry rose to great importance only within the past 6 years and now accounts for 25-30 percent of the total value of Peru's exports. Its 149 plants and about 1,800 purse-seiners ("bolicheras") are important employers.

In 1963, Peru produced 1.5 million metric tons of fish meal and sold it for an average of US\$130 a ton f.o.b. Callao. In 1964, production dropped to 1.2 million tons and the average price rose to \$160 a ton. The users found the supply unreliable, the cost exorbitant, and shifted to substitutes. In 1965, production was 1.4 million tons; average price was \$140 a ton. In October 1966, the average price was \$125 a ton. It is estimated that the average price for the present season will be about \$130 a ton.

On September 1, 1966, stocks stood at 243,896 tons. On October 1, the estimated stocks had risen to 296,688 tons; sales were very slow; about 200,000 tons had been sold against future shipments.

September 1966 Production A Record

Production in first-half September 1966 was 61,636 tons; for second half it was estimated at 60,000 tons--a record September and almost double the next best September. An excellent fishing year was forecast. The catch is not expected to be less than 7.5 million tons and may be higher.

There are possibly more than \$45 million in bank loans to the industry. Also, suppliers have extended much credit to their customers, perhaps as high as \$150 million. While it is difficult to assess the value of investments, some place it at \$200 million.

In October 1965, when the fishing season began, the industry faced an uncertain future. There were gloomy forecasts of a drastically reduced catch. However, production reached a record before the latter half of the season.

Initially, the Government limited that season's catch to 7 million metric tons. Later, it extended the season several weeks, permitting the limit to be exceeded. The actual allowable tonnage is determined during the season, based in part on recommendations of the Peruvian Ocean Institute.

The labor force in the plants and fleets must be considered. The last season was extended partly because of pressure from workers facing almost 4 idle months due to the closed season. Strikes have not been unusual. An extended strike in a major fishing area could affect production and world price.

The fishing fleets have expanded rapidly in number and size of vessels. This increase has been disproportionate to the increase in fish meal production. For example, in 1962, 1,070 seiners (with a total hold capacity of 58,713 tons) landed anchovy for a fish meal production of 1,120,796 tons. In 1963, 1,523 seiners, with a combined capacity of 98,460 tons, caught anchovy for a production of 1,159,233 tons of meal.

For the past 4 years, fish meal stocks at the end of August, traditional end of the fishing season, were:

Year	Metric Tons
1966	244,807
1965	46,425
1964	129,356
1963	142,377

The great increase in 1966 stocks is believed to reflect the lower world price, the waiting attitude of producers who thought they may have sold hastily in 1965, and fish meal sold but unshipped on that date.

Fish meal is shipped to many countries. In the first 8 months of 1966, destinations for important shipments--given as percentages of total shipments of 945,335 metric tons--were:

Country	Percentage
West Germany	19.5
United States	19.1
Netherlands	10.7
Spain	7.2
East Germany	6.5
Italy	6.2
Japan	5.9
Yugoslavia	5.1
Mexico	4.2
Poland	3.6
Others	12.0

Peru (Contd.):

Fish Oil Production Less Than Expected

Fish oil is derived from anchovy processing and is exported crude and semirefined. Production in 1965 and 1966 was less than would have been expected from the tonnage of fish landed because the fish were of small size and oil content.

Crude and semirefined oil exports were:

Year	Metric Tons
1966 (1st 8 months)	49,557
1965	111,238
1964	134,023
1963	110,035
1962	150,596
1961	98,088

Crude and semirefined oil was shipped to: Colombia, Denmark, Ecuador, France, Germany, Mexico, Netherlands, and Norway.

In the long run, the fish meal industry needs better plants (not more plants), better and larger fishing vessels (not simply more vessels), improvements of its overextended credit, a stable price for fish meal, increased research, and better trained men at all levels, afloat and ashore. (U. S. Embassy, Lima, Oct. 11, 1966.)



El Salvador

SHRIMP IS NO. 1 COMMERCIAL FISHERY

The only commercial fishery of importance in El Salvador is the shrimp fishery. Almost the entire production is exported to the United States. In recent years, about 5 million pounds, valued at about US\$ million, have been exported annually. An average of about 68 vessels accounts for the catch. (The Government presently restricts the number of shrimp vessels to 73.) The 68 vessels also land, incidental to the shrimp, about 3 million pounds of fish a year. Except for a small quantity exported to Honduras, the fish is sold entirely on the local market. Shrimp are El Salvador's third most valuable export--coffee and cotton are one-two.

The production of shrimp from coastal waters up to about 40 fathoms is believed at its peak, but further resources may exist in deeper waters. Modest increases in production can be expected in bottomfish trawling, pelagic fishing (chiefly anchovy for fish meal), and shellfish (from culture activities).

Marine science activities in El Salvador are restricted to very modest marine biology and resource-evaluation programs in the Government's fisheries administration, in the Ministry of Economy, and in the Biology Department of the University of El Salvador. Both programs are stimulated and supervised by a fishery biologist of the UN's Food and Agriculture Organization (FAO) and an associate expert.

The Government is keenly interested in expanding its fishing industry through internationally coordinated research. It was the original sponsor of a request to the Development Program (formerly Special Fund) of the United Nations for technical assistance on a regional basis (with the 5 Central American countries and Panama). The project was approved and is expected to initiate operations with headquarters in El Salvador. The nation also participated in a request to the UN Development Program for a regional project of coastal hydrography studies to improve navigation facilities and port development. This request presently is being considered. (U. S. Embassy, San Salvador, Nov. 29, 1966.)



Argentina

STERN TRAWLERS

CATCH AND FREEZE OCTOPUS

Two small freezer stern trawlers, "Puerto Madryn" and "Bahia Camarones," were delivered recently from Spain to Argentina. They are designed primarily to catch and freeze octopus (pulpo) on the Mauretania fishing grounds. The octopus is a very profitable fish for the Argentine market. The vessels also will be used off the Argentine coast for fresh fish and frozen fish as the market demands.

They are equipped for stern trawling using the Unigan system, which is well suited to their size. Preparation tables with washing facilities are fitted behind the winch under the shelter of the superstructure deck. An overhead conveyor, with hooks on it, carries the octopus to be frozen from the preparation tables to the freezer compartment forward of the winch on the port side. The stomachs are removed and drained; there is further drainage on the conveyor.

Argentina (Contd.):

Two, 20-station, vertical plate freezers of the top-unloading type are provided, with a total maximum freezing capacity of nearly 15 tons a day. Each freezer station is fitted with 4 removable dividers so, when freezing octopus, 5 evenly shaped blocks are produced; but one large block may be produced, if desired, for other types of fish. In the extremely small space available, no other type of freezer of equal capacity could have been accommodated satisfactorily.

After freezing, the blocks of octopus are packed in cardboard cartons, 5 blocks per carton. They are passed down through a very small hatch into the forward end of the frozen fish hold, where a temperature of -25°C . (-13°F .) is maintained. To save storage space, the frozen fish hold is cooled by spirally gilled convection cooling grids mounted on deckhead only. Wooden battens are fitted to ship's sides and bulkheads, and gratings on the deck, to allow natural circulation of cold air around the frozen cargo. The storage capacity for cartons of frozen octopus should be about 80-90 tons maximum.

The owners intend to use the vessels for fresh fishing outside the octopus catching season. For this purpose, the deck insulation in the hold has been made watertight, and a slush well is provided for removing melt water. In addition, a small insulated space, aft of the main hold, can be used to provide extra storage capacity. (Coprime-Ranken, S. A., Madrid 10, Spain, Aug. 1966.)



Chile

FISH MEAL FIRMS INTEGRATE

Some fish meal firms have integrated into a single operation to offset the financial difficulty experienced during the relatively poor 1965 season. The Chilean Industrial Development Corporation (CORFO) has set criteria for integration and will financially support certain activities and assist in selling fish meal produced by the integrated plants. Two groups already have been formed and negotiations are taking place for creating others. (Pesca, July 1966.)



Mexico

12-MILE FISHING LIMIT BILL IS SENT TO CONGRESS

On October 20, 1966, President Diaz Ordaz signed and sent to the Congress an amendment to the 1935 law that would extend Mexican fisheries jurisdiction from 9 to 12 miles. The territorial sea of 9 miles would remain in effect with an extension of 3 miles applicable only to fisheries jurisdiction. If enacted, the new law would permit foreign nationals now fishing in the 9- to 12-mile zone to continue in that zone without restriction for 1 year starting January 1, 1967. During that period, Mexico would negotiate with the governments of those nationals the conditions under which they would be permitted to continue fishing in that area for a maximum additional 5-year period--through 1972. Starting in 1973, however, no foreign country would be permitted any fishing rights within the 12-mile limit, and no historic fishing rights of nationals of any country would be recognized. (U. S. Embassy, Mexico, Oct. 21, 1966.)



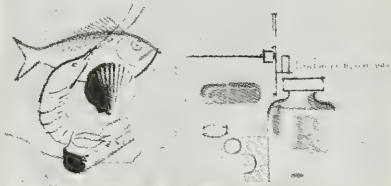
Brazil

EXTENDS FISHING LIMIT TO 12 MILES

On November 14, 1966, President Castello Branco signed a decree extending Brazil's territorial sea from 3 to 6 miles. The decree also established an additional 6-mile contiguous zone, thereby extending Brazil's fisheries jurisdiction to a total of 12 miles. (U. S. Embassy, Rio de Janeiro, November 17, 1966.)



SPECIAL DIETETIC VALUES



PREVENTION VS. PRESCRIPTION

WEST INDIES

Jamaica

PLANS TO EXTEND TERRITORIAL WATERS FROM 3 TO 12 MILES

Acting Prime Minister Donald Sangster, informed Parliament on October 18, 1966, of the government's decision to extend Jamaica's territorial waters from 3 to 12 miles. After parliament's approval of necessary legislation, a declaration will be made to the United Nations about this unilateral decision to expand the breadth of territorial waters around Jamaica, including the Morant and Pedro Cays.

The present 3-mile limit was established while Jamaica was a British colony. The need to protect the fishing industry was given as the primary reason for the extension. However, Sangster also noted that security interests were involved. (U. S. Embassy, Kingston, October 21, 1966.)



ELECTRIC SHARK BARRIER TESTED

An electrical shark repellent system is being tested by scientists from South Africa's National Physical Research Laboratory. It consists of two electrodes anchored to the sea floor and connected to a land-based generator. According to reports, laboratory experiments have shown that sharks in the presence of an electrical field tend to swim toward a positive electrode and away from the negative. The electrodes to be used in this test are so arranged that the positive electrode is farthest out to sea. A shark entering the electrical field will then presumably swim away from the shore. ("Sea Secrets," 1966.)

MID EAST

Israel

RECEIVES STERN TRAWLER-PURSE SEINER FROM DUTCH YARD

Probably the largest stern trawler yet built, which also can operate as a purse seiner without conversion, has been delivered to an Israeli firm by a Dutch shipyard. The 567-gross ton vessel the "Yam-Suf" is designed for tropical operations in the Red Sea and off the east and west coasts of Africa. The vessel can freeze 10 to 12 tons of fish a day. The purse-seine equipment is fitted on the starboard side and includes brailing boom and power block. The normal trawl winch is used to haul the purse-seine. A bow thruster unit is included to aid seine fishing. General specifications: length overall, 161 feet; moulded breadth, 28 feet; and main diesel engine, 1,200 horsepower.



Iran

AWARDS CAVIAR CONTRACT TO NEW YORK FIRM

A New York City firm, whose 3-year contract with the Iranian Fisheries Corporation had just expired, signed a 5-year contract for the sale of about 65 tons of Iranian caviar annually. The firm bid successfully on a tender covering all sales to the U. S. market. The Iranian Fisheries Company is government-controlled. (U. S. Embassy, Tehran, October 17, 1966.)



Kuwait

SHRIMP VESSELS BEING BUILT IN POLAND

The Szczecin Shipyards in Poland are building 20 steel cutters for Kuwait. The vessels are 17.6 meters (57.7 feet) long with a 170-hp. motor and a crew of 5. They will be used in shrimp fishing. (Budownictwo Okretowe, No. 7-8, 1966.)



EUROPE

USSR

STRESSES NEED TO IMPROVE FISHING INDUSTRY

In the list of 108 slogans approved for last October's 49th anniversary of the Russian Revolution approved by the Central Committee of the USSR Communist Party, slogan 79 was directed at the fishing industry. It stressed 3 aspects: 1) increased catch, 2) better quality of fishery products, and 3) lower costs for primary production. Of 28 industries or services, the fishing industry was one of only 4 where the necessity of lowering costs was specifically mentioned. The other 3 were transportation, coal mining, and hydroelectric power construction.

The slogan confirms the impression of some readers of Soviet publications that production costs are going to plague the fishing industry in the years ahead. New economic directives recently promulgated by the Soviet Government--"profit" not production is paramount--will begin to be introduced into the fishing industry early this year.

GOOD HERRING SEASONS IN NORWEGIAN SEA EXPECTED

The Norwegian Sea herring fishery was expected to be the largest operation conducted from the northwestern USSR during the 1966 fall fishing season. The Polar Scientific Research Institute for Fisheries and Oceanography (PINRO) forecast a good herring season because of the extremely large 1959, 1960, and 1961 year-classes--largest in recent years. Soviet scientists predict good herring fishing there at least until 1968.

The Fishery Administrations for Western and Northern European Soviet Union (headquartered at Riga and Murmansk) hoped that by increasing productivity of fishermen, improving gear, and increasing number of larger vessels, the 1966 average catch would be better than in 1965--despite forecasts by scientists of lower average catch per gill net. The 2 administrations are working on plans for the 1967 herring fishery.

Also, the Murmansk Fisheries Administration engaged in these fisheries during October 1966: 1) cod fishing off Western Greenland (1966 forecasts indicated better catches than 1965); 2) halibut fishing in the northern Atlantic (although catch expected to be lower than 1965, the forecast was for about 10 tons a day per vessel; in 1964, the total Atlantic Soviet halibut catch was 27,000 metric tons).

In the Barents Sea fishery, where catches have declined for years (probably because of overfishing) a dozen exploratory vessels were added to the fleet to find new stocks of the species formerly fished.

INCREASES HAIR SEAL HERDS IN CASPIAN SEA

By restricting the catch of adult, male, Caspian Sea hair seals, the Soviets have increased the herds to about 1 million animals. The Soviets plan to exploit hair seals at an increasing rate and, by 1980, hope to harvest 130,000 skins yearly. The processed skins are sold abroad and used for sport coat trimmings, ski skins, etc. Auctions take place in Copenhagen. Most of the world supply comes from Greenland.

UNDERWATER CRAFT TO STUDY CONTINENTAL SHELF RESOURCES

Leningrad designers have finished the blueprint for the construction of an underwater laboratory craft to study the fishery resources of the Continental Shelf. The laboratory, to be known as Benthos-300, will have a movie camera with telephoto lenses installed in the observation room. The facilities will be unusually spacious: 10 scientists at a time will be able to spend up to 2 weeks underwater in air-conditioned cabins with showers. There will be a dining room and kitchen for the crew. A rescue tower will connect the laboratory with the surface; equipped with a lock chamber, it will permit the crew to escape.

The Soviets are not neglecting the exploration of deeper ocean waters and the development of deep-water trawling, but they are quite aware that the bulk of the world's fishery catch (excluding seals and whales) is

USSR (Contd.):

presently landed from the Continental Shelf. The Benthos-300 is yet another indication that in the immediate future a great part of the Soviet fishing effort will continue to be on the Continental Shelf, where Soviet research has paid off in recent years by greatly increased landings.

The Institute involved in these plans is the Leningrad Branch of the Design Institute of the Fishing Fleet.

* * *

COLOR OF TRAWL NET AFFECTS CATCH

A Soviet gear specialist was recently placed aboard the medium side trawler "Navarin" fishing in the Gulf of Alaska to determine how the color of trawl nets affects catches. He found that a red-colored trawl caught more fish than a white trawl.

* * *

STUDY SEAWEEDES AS FOOD FOR COSMONAUTS

Scientists are studying the use of microalgae as food for space travelers on lengthy flights. Certain algae contain all the elements needed to feed man; also, they produce oxygen and absorb carbon dioxide. (Tass, October 12, 1966.)

The Soviet research may be done at least in part at Moscow's VNIRO Laboratory for the Study of the Technology of Marine Invertebrates and Seaweeds.

* * *

TEAM VISITS BRITISH LABORATORIES

A 3-man team of Soviet fisheries scientists visited Great Britain's biological laboratories at Lowestoft, Torry, and Aberdeen, the fishing ports of Hull and Grimsby, and other fishery installations. (Fishing News, October 28, 1966.)

The team found the Hull Fish Meal and Oil Works very interesting. The Soviet Union is greatly concerned about raising her fish meal production efficiently. Team members were second-level Soviet senior fishery scientists:

Poliakov, Director of the Baltic Fisheries Research Institute, the leader; Ponomarenko, head of a laboratory at the Murmansk Fisheries Research Institute; and an engineer.



Scandinavia

SEEKS GREATER CONSUMPTION OF HERRING FOOD PRODUCTS

Iceland has proposed, and other Nordic countries are considering, the possibilities for upgrading the use of valuable herring stocks in the North Atlantic, according to a leading Danish trade periodical. When big catches are landed, as in 1966, the major part goes to the oil and meal factories. The Scandinavians say it is unfortunate that herring is not used as human food to a greater extent.

In the last five years, Iceland has tried to improve the marketing of herring products, but the results have not been sufficient to accommodate the present large catches. A leading Icelandic industry member has proposed that a Nordic committee be formed to expand the use of herring products for human consumption by applying modern food preservation techniques. He suggested that working capital might be supplied by a tax on all herring exported from participating countries. If people throughout the world merely had the opportunity to buy herring, he said, they would enjoy it just as the Northern Europeans have for so many years. (U. S. Embassy, Copenhagen, Nov. 2, 1966.)



Iceland

GROUND FISH CATCH DROPS, HERRING FISHERY EXPANDS

The main trends in Iceland's fisheries are a declining groundfish catch, a rapidly expanding herring fishery, and rising production costs. So declining world prices for fish meal and oil may cause difficulties. (These trends interest the United States and other countries. Iceland is second only to Canada as a supplier of frozen groundfish blocks to the United States.)

Iceland (Contd.):

The rapid growth of the herring fishery has affected both the fleet and use of processing plants. Herring plants in some locations are now idle because the herring have moved elsewhere. At the same time, the trawler fleet has been allowed to become obsolescent.

It is estimated that herring plant operation is about 10 percent of capacity, and that the whole herring catch could be processed in 20 to 30 days if all existing facilities were fully used. Some underutilization of processing facilities, however, is inescapable because of the herring's roving habits. For several years, the herring banks have been moving from the north and south coasts to the northeast and east coasts of Iceland where herring fishing is becoming a year-round enterprise. Consequently the operation of the older herring plants, especially in the northwest, is now precarious because the plants remain idle most of the year.

Problems of Freezing Plants and Fleet

Production in freezing plants, which depend on cod and related groundfish, declined considerably during first-half 1966 due to an inadequate supply of fresh fish. (U. S. imports of frozen fish blocks from Iceland in January-September 1966 were down 17 percent from the 1965 period. The president of the Icelandic Freezing Plants Corporation said that production in some plants decreased by as much as 46 percent compared to 1964.

The modernization of herring vessels continues, but the deep-sea trawler fleet is in financial difficulties, despite high government subsidies. Years ago, the trawlers provided the freezing plants with a steady supply of fish on a nearly year-round basis. Now, however, the trawlers face inadequate catches and other operating difficulties. Some trawlers already have been sold; one has been converted into a herring vessel and another into a freighter. To alleviate these difficulties, proposals are being considered to grant trawlers new fishing grounds and reduce crew size.

The economic dependence on herring has caused increasing public concern about protecting fishing grounds and reserves. Fishermen are asking the government to extend fisheries limits even farther--to adopt con-

servation measures. In early 1966, the Minister of Fisheries prohibited fishing for small herring. (U. S. Embassy, Reykjavik, October 20, 1966, and other sources.)



Denmark

NEW PROCESS RECOVERS OIL, PROTEIN FROM FILLETING WASTE WATER

A new process to recover soluble protein and emulsified fats from filleting waste water is being used on a commercial scale at a large, new, herring fillet plant in Skagen, Denmark. The recovery operation involves concentration of oil and protein by chemical precipitation and flotation prior to heating--and separation of the residue by centrifuge. The process shows a high rate of recovery compared with traditional methods.

It is especially suitable for clarification of waste water from oily fish. Most filleting plants lose valuable residues through the usual washing and cleaning process. Removal of oil and proteins reduces contamination of waters by factory wastes. The oil from fresh fish is of fine quality and usually commands a high price.

How Process Works

First, the waste water is screened and the larger solid particles go to a fish meal factory. The water then goes into a storage tank, then it is pumped into a flotation tank where chemicals are added to precipitate the protein matter. By the addition of fine air bubbles, which become affixed to the free particles, the precipitate is brought to the surface of the flotation tank. Clear water remains below. The concentrated fat and solid matter is skimmed off into a heating tank to facilitate its separation in the centrifuge. The first step is a protein centrifuge, where the solid matter is separated. The fluid then is carried to an oil centrifuge, where the oil is separated from the water. The cleaned oil is carried to storage tanks, and the water is recirculated.

The firm ran tests on waste water from summer herring-filleting operations containing about 2.8 percent oil and 0.9 percent protein. The plant extracted per cubic meter 27.9 kilograms of oil and 7.5 kilograms of

Denmark (Contd.):

protein. By traditional methods, recovery was 25 kgs. of oil and 4 kgs. protein. Winter operations, in which waste water contained only about 0.3 percent oil, gave a recovery of 2.9 kgs. oil compared with 0.5 kgs. by traditional methods.

The biological oxygen demand (BOD) of the waste water is reduced by 85 percent of the original value. The process is automated and requires little manual attention.

The recovery equipment described has been developed by Aminodan A/S, Skagen, Denmark. Write to that firm for additional information. (U. S. Embassy, Copenhagen, November 2, 1966.)



East Germany

1965 LANDINGS UP ONLY 3 PERCENT

The 1965 landings of 231,000 metric tons of fish were only about 3 percent more than the 1964 landings of 225,000 tons. Fresh-water fish landings were small: 11,100 tons in 1965, compared to 10,700 tons in 1964. Most marine fish came from the Northeast Atlantic (128,850 tons) and Northwest Atlantic (92,440 tons).

The good cod year (57,300 tons in 1965; 45,100 tons in 1964) insured higher total landings in 1965--since the traditionally large North Atlantic herring fisheries were poor in 1965--only 79,100 tons, compared to 87,700 tons in 1964. All Atlantic herring was caught in the Northeast Atlantic, while 90 percent of the cod (51,165 tons) was caught in the Northwest Atlantic.

During 1965, the East Germans did not fish in the Central or South Atlantic Ocean. Their expansion into those areas began in 1966.



Bulgaria

1965 LANDINGS WERE UP 30 PERCENT

In 1965, the Bulgarian fishing fleet landed 19,800 metric tons of fish and shellfish--30

percent more than the 13,200 tons of 1964. Crustacean landings of 2,500 tons were down from 1964's 3,300 tons, but fish landings almost doubled--from 9,900 tons in 1964 to 17,300 tons in 1965. The large increases in landings resulted from the high-seas fisheries developed during 1965, with Soviet-purchased stern factory trawlers, off Africa's western coasts--mostly off Walvis Bay.



Italy

JAPANESE ASSESS FROZEN TUNA IMPORT SITUATION

The Japanese Frozen Foods Exporters Association's Special Committee on Tuna Exports to Italy discussed the possible expansion of the frozen tuna 40,000-metric-ton import limit at a minimum tariff. The group decided to focus attention on 1967 export problems, not 1966's, for several reasons: It is impossible to control the exports to Italy in 1966; there is a good possibility that the 15-percent tariff rate (40,000 tons) may be avoided--and, because of market conditions, frozen yellowfin will go to the United States, not Italy.

Export market conditions for frozen albacore and yellowfin for North America are especially favorable. A recent contract was signed to ship frozen yellowfin to Canada at C\$470-\$475 a short ton c. & f.--a \$30 rise in the last 10-20 days. Similarly, the price for albacore has risen to \$520 c. & f.--about \$30 above the end-of-August price. The active buying by United States packers is due to a good summer sale of canned tuna.

Japan Not Italy's Only Supplier

From January-July 1966, Italy imported frozen tuna from countries other than Japan: Taiwan, 3,000 metric tons; Republic of Korea, 1,400-1,500 tons; Australia, 600 tons. Italy plans to import another 2,000 metric tons from those countries through 1966.

Because of a strike at the Sala cannery on the Adriatic (for wages at least 25 percent higher), an increased inventory of tuna, and a possible imposition of the 15-percent tariff over 40,000 metric tons, the plant's buyers will attempt to lower the purchase price for frozen tuna. (Fishery Attaché, U. S. Embassy, Tokyo, October 6, 1966.)



Greece

ATLANTIC CATCH IS UP 14%

From January-August 1966, the Greek fleet in Atlantic waters landed 18,117 metric tons of frozen fish, compared with 16,029 tons in same period of 1965 (up 14 percent). On September 1, the Greek Atlantic fleet of freezer trawlers had 33 vessels in operation; another 3 were preparing for shrimp fishing in the Persian Gulf. The government is formulating plans to establish fishing jetties in Piraeus, Thessaloniki, Cavalla, and Chalkis which would include refrigerated storage. (U. S. Embassy, Athens, October 21, 1966.)



United Kingdom

MOUNTS PROMOTIONAL CAMPAIGN FOR "FISH--THE BIG DISH"

The slogan of a marketing campaign by the British Government's Fish Information Service (FIS) is "Fish--the Big Dish." The British consumer, like the American, often looks on fish as a substitute or supporting course. The FIS is working to change this attitude with an advertising campaign and efforts to get a new look in fish marketing shops. (Fishing News, October 14, 1966.)

* * *

MARINE FISH FARMING OF GROUND FISH WILL BE LONG-RANGE PROJECT

Marine fish farming of groundfish species is still a long way off, according to the Brit-

ish White Fish Authority (WFA). A British project to raise plaice and sole in Scottish coastal lochs is continuing, but WFA says it may be at least 10 years before the project makes any contribution to British fish supplies. (Fishing News, London, October 7, 1966.)

* * *

DOUBLED ITS FREEZER STERN TRAWLER FLEET IN 1966

At the beginning of 1966, there were 10 large freezer trawlers in the British fishing fleet. During the year, 12 were added. The latest addition was the 224-foot "Coriolanus" christened November 30. All but one of these new vessels are over 210 feet and can hold 400-600 tons of fish. The exception is the 185-foot "Criscilla," an experiment in economy, with a crew of only 21.

* * *

NEW FISH-GUTTING MACHINE

A small machine said to be capable of gutting fish at the rate of 25 a minute is being tested by the fishing vessel "Coral Isle." The machine is 12 inches long, 18 inches high and has been patented by a British fish merchant. It was described in the "Fish Trades Gazette," 17/19 John Adam Street, Adelphi, London, W. C. 2, England. (Write to it for more information.)



ANTARCTIC SEALS PLENTIFUL

Although the whales are disappearing, the seals are coming back. Australian biologists working at a station on MacQuarie Island, Antarctica, found that the population of the elephant seal on the island has increased from near extinction 85 years ago to a present population of 100,000. The stable population consists of about 36,000 cows and 4,000 bulls, with about 35,000 young produced each year.

The elephant seal was almost exterminated as a result of commercial sealing operations during the nineteenth century. The population has increased steadily since the commercial killing of seals was halted nearly fifty years ago. (Sea Secrets.)

ASIA

Japan

PURSE-SEINE TUNA FISHING OFF WEST AFRICA IS POOR

The fishing company Nichiro's 3 vessels conducting experimental two-boat purse-seine operations in the Gulf of Guinea off West Africa are encountering poor tuna fishing again after a brief period of improvement in September. Catches in October, averaging 10-15 tons of tuna per vessel per day, were far below the planned production of 25 tons per day. (Shin Suisan Shimbun Sokuho, Nov. 1, 1966.)

* * *

PERMITS TRANSHIPMENT BY PORTABLE-BOAT-CARRYING TUNA MOTHERSHIPS

The Japanese Government recently revised the Frozen Tuna Export Adjustment Regulations to permit portable-boat-carrying tuna motherhips operating in the Pacific Ocean to transship their catches for export. Before, only the regular-type tuna motherhips and overseas-based vessels were permitted to transship catches in the Pacific Ocean; all other vessels had to bring their tuna back to Japan before export. This meant doubling transportation costs in some cases. But the purpose of this regulation was to assure supply to domestic tuna packers and cold-storage operators. Transshipment was authorized for the portable-boat-carrying mothership fishery because the operation of regular-type motherhips had declined--brought on by the difficulties of contracting catcher vessels to fish for them.

Following the revision, Taiyo Fishing Company's 3,700-gross-ton "Banshu Maru No. 5," operating in the South Pacific, would be the first portable-boat-carrying mothership to conduct tuna transshipments in the Pacific Ocean. It planned to deliver its catches to Suva, Fiji Islands, in mid-November 1966. (Katsuo-maguro Tsushin, Nov. 2; Minato Shimbun, Oct. 26, 1966.)

* * *

VESSELS TRANSMIT REPORTS FROM YELLOWFIN TUNA REGULATORY AREA

Japanese vessels entering the eastern Pacific yellowfin tuna regulatory area are transmitting reports to the Fisheries Agency in accordance with reporting requirements prescribed in the Japanese tuna regulations. Transmission is proceeding smoothly. Reports received in early November were mostly from vessels that entered the regulatory area after October 21, 1966. (Katsuo-maguro Tsushin, Nov. 2, 1966.)

* * *

1966 KING CRAB FISHING ENDS SUCCESSFULLY

The king crab factoryship "Keiko Maru" completed operations in Bristol Bay October 13 after attaining her 1966 production quota of 94,467 cases (48 half-pound cans) of canned crab meat. The "Dainichi Maru", the other factoryship licensed for Bristol Bay, attained her quota of 90,533 cases in September. Both vessels and their accompanying fleets began operations in March. Together, the vessels attained the quota of 185,000 cases agreed upon by Japan and the United States. Japan's 1966 production of canned king crab from all fishing areas was 463,000 cases.

The king crab fisheries are divided into factoryship fisheries and catcher-boat fisheries, the latter conducted in waters near Nemuro on the northeastern coast, and Wakkanai on the northwestern coast of Hokkaido. About 10 percent of the annual production comes from catcher-boat fisheries.

The factoryships, which produce 90 percent, operate in the Eastern Bering Sea (Bristol Bay), Western Bering Sea (off Cape Olyutorski), and in the Sea of Okhotsk. This year's Sea of Okhotsk quota was set at 240,000 cases as agreed upon by the International Northwest Pacific Fisheries Commission. This year, one company conducted trial operations off Cape Olyutorski and produced 38,000 cases of canned crab meat.

More than half of Japan's annual output of canned king crab meat is exported to the United States, the United Kingdom, France,

Japan (Contd.):

and other western countries. Canned king crab meat has consistently been a good money earner for Japan. Recently, however, because of the increase in the Japanese standard of living and the growing prosperity in the country, a strong domestic demand has developed for canned king crab meat. In October 1966 the retail price in Japan was close to \$1.00 a can, about the same price as in the United States. It is expected, therefore, that Japanese exports of canned crab meat will decrease. (Nihon Keizai, Oct. 14, 1966, and other sources.)

* * *

LARGE FISHING COMPANY TO BUILD 300-TON PURSE SEINER

A large fishing company has ordered construction of a 300-ton purse seine vessel at a total cost of about 200 million yen (US\$556,000). Launching is scheduled for February 1967. The vessel will have a power block, refrigerating capacity of 86 tons, and a speed of 11 knots. The firm plans to operate the seiner year-round in the central west Pacific off Guam Island, and the south Pacific off New Zealand, as a replacement for the 240-gross-ton "Kenyo Maru," which operated in the South Pacific in 1964-65. The latter was the first Japanese purse seiner to adopt the power block in 1962. (Shin Suisan Shimbun Sokuho, Oct. 26, 1966, and other sources.)

* * *

LARGE OCEANOGRAPHIC RESEARCH VESSEL LAUNCHED

The largest Japanese oceanographic research vessel, the "Hakuho Maru," 3,200 gross tons, was launched November 1, 1966, at the shipyard in Shimonoseki, southern Japan. Ordered by the Oceanographic Research Institute, University of Tokyo, the vessel is being built at a total cost of 1.65 billion yen (US\$4.58 million). Completion of outfitting is scheduled for early May 1967.

It will accommodate 55 crew members, 32 scientists and technicians, and foreign researchers. Its specifications: total length--86 meters (282 feet); beam--14.8 meters (48.5 feet); draft--7.3 meters (23.9 feet); main engine--four 1,100-horsepower diesel engines; maximum speed--15 knots; cruis-

ing speed--12 knots; maximum cruising range--15,000 nautical miles. (Minato Shim-bun, Nov. 2, 1966.)

* * *

OBSERVERS ARE ABOARD SOVIET VESSELS

A 4-man team left Japan for a Murmansk base on October 11, 1966, to board a large Soviet factory stern trawler scheduled to leave for the Northwest Atlantic on October 26. The team--2 scientists from Tokai Fisheries Research Laboratory and 2 representatives of 2 large Japanese fishing companies--will observe Soviet fishing and processing operations. (Suisancho Nippo, Oct. 7, reported by U. S. Embassy, Tokyo, Oct. 18, 1966.)

* * *

INCREASES FISH MEAL IMPORTS

Japan had to increase imports of fish meal to supplement her own expanding output between 1960-1964. She did this even in 1965, when domestic production reached 374,100 metric tons. The increases were absorbed by the animal feed industry which doubled its use of fish meal during 1960-1964.

Fish Meal Production, Foreign Trade, Consumption, and Prices, Fiscal Years, 1960-1965						
Item	Fiscal Years					
	1965	1964	1963	1962	1961	1960
	. . . . (1,000 Metric Tons)					
Production	374	375	301	323	278	244
Imports	84	122	86	36	38	18
Consumption						
For mixed feeds	346	371	308	243	218	171
For fertilizers	76	88	72	92	89	89
Exports	13	6	4	18	5	-
	. . . . . (US\$)					
Avg. import prices (c.i.f.) per metric ton	155.0	134.6	133.3	132.3	121.7	108.4
Number of fish meal factories in Japan	169	165	157	1/	1/	1/
1/Not available.						

Imports and consumption declined slightly in 1965, probably as a result of rising prices and the tight world supply situation. Exports were insignificant in 1960-1965.

* * *

41% OF IMPORTED EDIBLES COMES FROM 3 COMMUNIST NATIONS

During first-half 1966, Japan imported 76,240 metric tons of edible fishery products,

Japan (Contd.):

Imports of Fishery Products from Communist Countries, January-June 1966						
Product	North Korea	China	USSR	Total	Total Imports	Percentage of Total
Fresh & Frozen:						
Fish:						
Bonito & tuna . .	-	73	-	73	4,721	2
Herring	-	50	3,001	3,051	3,051	100
Spanish mackerel .	-	2,824	-	2,824	5,238	54
Sea bass	-	56	-	56	110	50
Hair tails	-	3,636	-	3,636	3,809	95
Croakers	-	2,457	-	2,457	3,187	77
Other fish	-	1,450	558	2,008	5,432	37
Shellfish:						
Shrimp, etc. . . .	-	6,476	4,986	11,462	19,367	59
Other shellfish . .	-	551	35	586	22,776	3
Ro:						
Caviar, etc. . . .	-	10	60	70	123	58
Herring	-	15	49	64	201	32
Salted Dried:						
Shellfish	2	42	-	44	1,865	2
Jelly fish	-	1,984	-	1,984	1,884	100
Other	-	368	1,131	1,499	1,526	98
Canned:						
Shellfish	-	50	-	50	135	37
Otherwise Preserved:						
Shellfish	40	1,473	-	1,513	2,714	56
Total	42	21,515	9,820	31,377	76,240	41

of which 31,377 tons (41 percent) came from three Communist countries--China, USSR, and North Korea, in the order named. Fresh and frozen shrimp was the largest volume item--19,367 metric tons, of which 11,462 tons (59 percent) came from those three. (Fishery Attaché, U. S. Embassy, Tokyo, Oct. 21, 1966.)

* * *

CANNED CRAB SALES DECLINE IN 1966

Decreased sales of canned crab were reported by the Japanese Canned Salmon and Crab Joint Sales Company. Exports for 1965 and 1966 by country of destination were:

Canned Crab Sales, 1965 and 1966				
Destination	1965 Total	1966		
		To Nov. 1	Future	Total
		(In Cases)		
France	85,000	46,000	35,000	81,000
United States	132,000	38,000	30,000	68,000
United Kingdom	90,000	48,000	-	48,000
Other	37,000	18,000	1/	1/
Total	344,000	150,000	1/	1/

1/Not available.

Exports of canned crab in 1966 would be about 100,000 cases less than in 1965, and the difference would occur in lower exports to the United States and United Kingdom. (Fishery Attaché, U. S. Embassy, Tokyo, Nov. 8, 1966.)

* * *

RAISE CANNED SHRIMP PRICES

Prices for canned shrimp were raised again by the Canned Shrimp and Crab Joint Sales Company. Price quotations for various sized case packs were:

Canned Shrimp Price Quotations					
Cans/ Case	Size	Type	New	Previous	Beginning of Fiscal Year
			(US\$)		
24	No. 2	Mix size	9.50	9.00	8.50
48	No. 3	Mix size	11.40	10.80	10.20
24	No. 2	Broken	8.50	8.00	7.50
48	No. 3	Broken	10.20	9.60	9.00

Of 150,000 cases consigned to the Joint Sales Company, 50,000 cases sold at the price at the beginning of the fiscal year, 50,000 cases were sold at the previous price, and the remaining 50,000 cases were to be sold at the new price. Prices rose following the poor 1966 season for "northern" shrimp and the smaller pack. (Fisheries Attaché, U. S. Embassy, Tokyo, Nov. 8, 1966.)



India

SETS FISHING GOALS UNDER
NEW 5-YEAR PLAN

An annual fish catch of 1.53 million metric tons by 1970-71 is the goal of the Indian Government's fourth 5-year plan. A catch of 1.3 million tons in 1964 was reported by the UN's Food and Agriculture Organization, although India estimates its current annual catch at only about a million tons. The 5-year plan calls for new investment in the industry of Rs. 1,130 million (US\$149 million). It calls for almost a threefold increase in fishery exports--to an annual value of Rs. 200 million (\$26.3 million)--by 1970-71.

Technological improvement and expansion of the fisheries cooperatives will be stressed so they may play an increasingly important role in production and marketing. In particular, it is proposed to acquire 200 trawlers, construct 8,000 mechanized vessels, develop fishing harbors, set up more ice and cold storage plants, and provide refrigerated vans for long-distance transport from points of landing to points of consumption.

For inland fisheries, production is to be increased by developing unutilized areas,

India (Contd.):

intensive exploitation of existing culturable waters, and other measures. Facilities for research and training also are to be expanded. (Seafood Trade Journal, Cochin, India, Oct. 1966.)



South Korea

PLANS FISH CANNERIES WITH HELP OF U. S. FIRMS

The Republic of Korea plans to develop, in a joint venture with U. S. firms, marine product canneries and a fishing fleet. The fleet will operate in the fishing grounds south of Cheju Island in the East China Sea where mackerel are plentiful, and in the Southwest Pacific, where skipjack and yellowfin tuna abound.

Under the plan, 60,000 metric tons of mackerel and 20,000 tons of tuna are expected to be caught and canned annually by the processing plants. (Korean Business Review, Sept. 1966.)



North Korea

NEEDS BETTER FACILITIES FOR FISHERY PRODUCTS

North Koreans presently catch 500,000-600,000 metric tons of fish, shellfish, and other aquatic products, First Deputy Prime Minister Kim Il said on October 10, 1966. He made the statement during a major policy speech to the Conference of North Korean Communist Activists.

Despite this large catch, the public's demand is not being met because of poor processing facilities and unsatisfactory marketing and distribution methods. To overcome these problems, fish-processing facilities must be built not only in fishing areas but in consumption (urban) areas. Refrigerated storage facilities will be built in Pyongyang and in other major cities.

In 1955, according to FAO statistics, North Koreans landed 312,000 metric tons of fish-

ery products, about 50-60 percent of the present catch. This growth rate is much smaller than that of South Korea; there, landings of 265,000 tons in 1955 increased by 112 percent to 562,000 metric tons in 1965. (If aquaculture's production is added to the 1965 figure, as North Korea did, then the total South Korean production would be 636,000 tons.)

The Republic of Korea, unlike North Korea, has developed modern fish-processing facilities, purchased many large-powered vessels, and thus established a solid base for a modern fishing industry.



Taiwan

U. S. BUYS OVER HALF FISHERY PRODUCTS

During 1965, the Republic of China (Taiwan) exported NT\$61.0 million worth of fishery products and imported NT\$38.5 million. Almost 95 percent of all exports were shipped from the port of Tainan in southwestern Taiwan; the remaining 5 percent from Taipei. The United States was the largest buyer (NT\$34.7 million), followed by Japan (NT\$25.6 million); exports to other countries--Ryukyu Islands, Hong Kong, Singapore, Thailand, etc.--were negligible. The largest single export item (NT\$36.6 million) was shrimp and other crustaceans; both were imported mainly by the United States (NT\$18.6 million) and Japan (NT\$18.1 million). Fresh and frozen (mostly frozen tuna) fish, the second largest export item (NT\$19.3 million), were bought mostly by the United States (NT\$16 million) and Japan (NT\$3.3 million).

Taiwan's fishery imports in 1965 were NT\$38.5 million; most (NT\$34.6 million) entered at Taipei in north Taiwan. South Korea was the largest supplier of fishery products (NT\$29.8 million), followed by Japan (NT\$7.3 million) and "unidentified countries" (NT\$1.2 million). Cuttlefish made up the largest part of the imports (NT\$27.2 million), coming mostly from South Korea (NT\$26.5 million). Other major imports were seaweeds (NT\$6.9 million) from Japan and South Korea, and fish fry (NT\$1.4 million) from Japan. (The Trade of China, 1965, pp. 205-212.)

Note: NT\$40.10 equal US\$1.00.

Taiwan (Contd.):

PRODUCERS MAY ESTABLISH JOINT TUNA SALES SYSTEM

Leading tuna producers in Taiwan may organize a joint sales company to handle export tuna. Despite the spectacular advance made by the industry with government assistance, the lack of sufficient marketing experience by fishery firms has caused producers to sell catches for immediate gains or at low prices. The establishment of a joint sales system is considered likely to exert a significant effect on tuna sales. (Katsuo-maguro Tsushin, Nov. 2, 1966.)



Malaysia

ANNUAL LANDINGS CONTINUE TO RISE

Malayan fishery landings have risen steadily in recent years despite the impasse over trawling in Indonesian waters that has prevented greater progress in the fishing industry. The 1965 catch of 198,000 metric tons (worth about M\$168 million) was 31 percent above the 1961 figure. The increase is believed due mainly to mechanization and the use of larger craft.

As vessels become larger, traditional methods of navigation and fishing will no longer suffice. The Malayan Government intends to prepare for this by setting up a Fisheries Training Center in Penang. (U. S. Embassy, Kuala Lumpur, Sept. 13, 1966.)



Thailand

EXTENDS TERRITORIAL LIMITS

The King of Thailand signed a proclamation, published October 18, 1966, establishing a 12-mile territorial limit measured from the low-water line.



Australia

INTEREST IN FISH MEAL PRODUCTION RISES

Consumption of fish meal has increased twentyfold in the past 10 years, due mainly to its value as a high-protein food for fattening poultry and pigs. No serious attempt has yet been made to establish a large-scale industry in Australia, which relies heavily on imports. But interest is quickening. The Fisheries Branch, Commonwealth Department of Primary Industry, recently studied prospects for a local industry.

Consumption of fish meal rose from 1.3 million lbs. in 1956/57 to 26.7 million lbs. in 1964/65. During the five-year period to 1963/64, pork production rose by 20 million lbs., and poultry meat production by 11 million lbs.

Domestic production of fish meal did not increase at the same rate as consumption between 1956/57 and 1964/65. Today, it supplies only about 9 percent of local requirements. Existing plants rely mainly on offal from processing factories. The fish meal produced is only about 50 percent protein--compared with 65 percent in imported meal.

Imports from S. Africa

Australia imported 24.3 million lbs. of fish meal worth \$1.2 million in fiscal year 1964/65. South Africa was the main supplier. The price rose to \$A220 (about US\$245) a short ton for 65 percent meal.

It is anticipated that the demand for fish meal will continue to increase to satisfy the growing broiler industry, but unless domestic production increases significantly, most of its requirements will be imported. Any significant increase in production can only be achieved by exploiting fish specifically for fish meal.

Unassessed stocks of pilchards and other fish suitable for reduction are in waters around Australia. The present demand and high price for fish meal has stimulated interest in a fish meal industry to exploit them.

Australia (Contd.):

TUNA FISHING GOOD IN 1966

The total tuna catch in 1966 was about 9,164 short tons, most destined for the United States.

South Australia's record-breaking tuna catch for the 1966 season was 6,688 short tons, about 625 tons higher than the 1964 record. One reason was that 10 more vessels were used, bringing the fleet to 31.

Tuna fishing is now a vital part of the fishing industry, although it was not widely practiced until the early 1950s. An aerial survey of tuna schools off the New South Wales south coast in 1936 aroused interest in tuna fishing. It was tried in 1937, with no significant catches.

Learned Pole-and-Line Bait Method

In 1950-51, the Australian Federal Government sponsored the visit of a 53-ft. American-Fijian tuna clipper with a trained crew to instruct local fishermen in the pole-and-line-bait method of fishing. Australian fishermen rapidly became expert and the tuna catch rose dramatically.

Fishermen concentrate on the southern bluefin tuna, which has a juvenile weight of 20-80 lbs. The young tuna swim in schools and fishermen can pole-catch many in little

time. As the tuna grow, they move into deeper waters and are caught largely by the Japanese using the long-line method. ("South African Shipping News and Fishing Industry Review," Oct. 1966.)



Fiji Islands

TUNA BASE CONTRACTS TAIWAN AND ROK VESSELS

The Fiji Islands tuna base has contracted 8 Taiwanese and 7 South Korean vessels to fish for it. The base is a joint Japanese-Fijian venture established in 1964 by the South Pacific Fishery Cooperative Association and the Pacific Fishing Company and operating 10 Japanese tuna vessels.

The 15 vessels, ranging from 80-170 gross tons, will begin operations at the end of 1966. Fishing off the Fiji Islands, unfavorable in November because of the seasonal change in the fishery, normally improved in December. Tuna catches in nearby waters now are averaging 0.8 ton per vessel per day, mostly albacore. (Suisancho Nippo, Nov. 4, 1966.)



AUSTRALIA DEVELOPING PEARL CULTURE INDUSTRY

The Australian pearl culture industry, started in 1956, is still developing. There are now 11 culture farms scattered across Northern Australia from Exmouth Gulf to Torres Strait, in various stages of production, and they employ 82 Japanese and 153 Australians.

Pearls are being cultured in the large Australian pearl oyster (Pinctada maxima) which can produce a round pearl up to 18 mm. ($\frac{45}{64}$ inch) in diameter in from 2 to 3 years--about half the time it takes in Japan where the culturing technique was perfected. The Japanese culture the small Akoya oyster (Pinctada martensii) which produces a pearl up to 11 mm. ($\frac{7}{16}$ inch) in diameter in 4 to 7 years.

Japan has 3,000 culture farms which in 1963 produced 79 metric tons of pearls for export, worth £A23 million (US\$51.3 million). The United States, Switzerland, West Germany, and Hong Kong were main buyers.

Australian cultured pearls are sent to Japan where rounds are graded and half rounds processed, then re-exported to world markets where they have a high reputation for size and quality. (Australian Fisheries Newsletter.)

AFRICA

South Africa

SHOAL CATCH WAS DOWN IN 1966

The Cape west coast shoal fish catch, January-August 1966, was somewhat less than for the same period in 1965 (see table).

Species	1966		1965	1964
	Aug.	Jan. -Aug.	Jan. -Aug.	Jan. -Aug.
	(Short Tons)			
Pilchards	5,746	125,766	222,920	282,301
Maasbanker	3,987	26,419	44,753	22,121
Mackerel	-	61,285	43,967	57,222
Anchovy	25,271	155,452	134,807	25,709
Red-eye herring	-	4,980	-	-
Total	35,004	373,902	446,447	387,353

In 1965, the season for pilchard, maas-banker, and mackerel closed at the end of July, but anchovy fishing continued until the end of September. The 1966 shoal fishing season, scheduled to end on August 31, was extended through September. In 1964, the pelagic fishing season closed at the end of July.

The August 1966 catch yielded 7,766 short tons fish meal, 116,000 imperial gallons of fish-body oil, and 456,420 lbs. of canned maasbanker.

In South-West Africa, the August 1966 catch was 57,750 tons pilchards and 27 tons of anchovy. This brought the total catch for the first eight months of 1966 to 680,186 tons. August fish meal production was 14,451 tons, bringing the total to 163,707 tons. ("South African Shipping News and Fishing Industry Review," Oct. 1966.)

DRY OFFLOADING REDUCES EFFLUENT AT FISH MEAL PLANTS

Dry fish offloading systems help to cut the amount of effluent from fish meal factories. "All fish factories discharge considerable quantities of water which has been used for offloading or washing fish," says the assistant director, Fishing Industry Research Institute. He adds: "Originally trouble rose at Hout Bay, south of Capetown, where off-loading water containing oil and other soluble matter was discharged into the Bay. When the currents and the winds were unfavorable

some of this used to wash up on to the beach. Then the factory installed a dry offloading system--the biggest installation of its kind in the world. It operates like a colossal vacuum cleaner. Hoses with a diameter of 10 inches simply suck up the fish. However, it is suitable only for fish intended for fish meal, as it damages fish too much for canning."

The usual method of offloading pelagic fish is to pump water into the boat's hold and then to suck it out, taking the fish with it. (The Cape Town Times, Shipping Supplement, Oct. 7, 1966.)



South-West Africa

PILCHARD FILLETS ARE EXPORTED

An export market has been established for frozen South-West African pilchard fillets. The Fishing Industry Research Institute has developed a way of freezing them so that rancidity is reduced to a level that insures a shelf life of several months. Without this treatment, the oils in frozen pilchard would turn them rancid in a matter of weeks. (The Cape Town Times, Shipping Supplement, Oct. 7, 1966.)

PILCHARD EGGS ARE SCARCE

An apparent shortage of pilchard eggs off Walvis Bay in 1966 has been worrying scientists manning research vessels operating from that port. The Chief Fisheries Officer of the South-West African Administration, Marine Research Laboratory at Walvis Bay, said it was difficult to attribute this development to any particular cause at this stage. But foreign fishing trawlers do not normally operate in the spawning grounds, so the lack of eggs could not be ascribed to these vessels. ("South African Shipping News and Fishing Industry Review," Oct. 1966.)

16 NATIONS FISH OFF COAST

Vessels from all over the world fish off the coast of South-West Africa. At first the

South-West Africa (Contd.):

foreign trawlers caught white fish, but later extended their activities to pilchard. This was especially true of the Soviet fishing fleet. Fifteen countries, plus South Africa, operate off the South-West Africa coast:

USSR: It has by far the most modern fishing fleet, which catches pilchard, white fish, and crab. It was estimated that the Russians would catch about 150,000 metric tons of pilchard in 1966. At times, the fleet numbered over 40 vessels and operated mainly north of Walvis Bay. It is supplied by depot ships and tankers shuttling between Russian ports and the fishing grounds. Most fish products are taken back to the Soviet Union, although some is sold to West Africa.

Spain: A fleet of about 50 vessels, second largest, specially designed for African waters. They catch hake, all sent back to Spain. They make regular use of Walvis Bay for stores, oil, water, and transshipping to reef-er vessels.

Japan: A sizable fleet catches white and red fish, which are sent back to Japan. The vessels use Cape Town as a base.

West Germany: 3 ultramodern trawlers catching hake.

France: Small trawlers for spiny lobster.

Ghana: 3 Soviet trawlers on charter and manned mainly by Russian crews.

Israel: 2 modern trawlers operating between Walvis Bay and Cape Town. The fish is frozen and sent back to Israel.

Belgium: One trawler operating under charter to a South-West Africa fishing concern and catching hake for the Congo and Belgium markets.

Poland: A small fleet catching mainly white fish.

East Germany: One stern trawler catching white fish.

Bulgaria: Several trawlers catching both white fish and pilchard.

South Korea: A fleet of 20 tuna long-liners operating in the South Atlantic between

200 to 400 miles of Walvis Bay. They make regular use of Walvis Bay for stores, oil, and fresh water.

Nationalist China: A small fleet of tuna long-liners, also operating further out to sea off the coast.

Holland: Several stern trawlers. There is talk they may leave to find other fishing grounds nearer home.

Italy: 3 large stern trawlers catching white fish.

South Africa: In addition to white fish trawlers, there is the world's biggest floating factoryship, the "Willem Barendz." Operating outside the 12-mile fishing limit, she is expected to catch about 110,000 tons of pilchard a year. ("Namib Times," Walvis Bay, South-West Africa, Sept. 30, 1966.)



Morocco

SARDINE CATCH IS UP, EXPORTS DOWN

Among the recent measures taken by the Moroccan Government to revive the ailing fishing industry was the reduction of the cost of cans and packing oil used by canneries. The fixed price paid by canneries to boat owners for raw fish was also reduced by the Government to make the Moroccan fish pack more competitive in the world markets. It is too early to see if increased export sales will result from these measures.

Early reports of the actual catch indicate that the 1966/67 season may be a record one in total catch of sardines. However, statistics for 11 months of the 1965/66 season show that exports of canned fish were lower than in any of the last 10 seasons. Morocco faces difficult problems in reestablishing its canned fish in world markets.

Fresh fish sales in local markets (an important source of income to fishermen) have continued to drop because the European population, principal consumer of fresh fish, declines. The Casablanca wholesale fish market accounted for the sale of US\$2 million in fresh fish during the first nine months of 1966. Agadir supplies over half the fresh fish for the Casablanca market. (U.S. Embassy, Rabat, Nov. 21, 1966.)



Foreign Fishing Off U. S. Coasts in October and November 1966

IN NORTHWEST ATLANTIC

Soviet: Weekly sightings showed fleet ranged between 50 and 60 fishing and support vessels through October, the same as at the end of August. However, the greatest number of individual vessels sighted during October was 72. Not all 72 were present throughout the month.

Fleet size during August-October 1965 was about the same as that during same period in 1966. Beginning in mid-October 1965, however, the fleet decreased rapidly. By month's end, only 10 fishing and support vessels remained on Georges Bank. The greatest number of individual fishing and support vessels sighted in October 1965 was 74.

In October 1966, the fleet was scattered but generally concentrated in two main groups: (1) Between 15 and 20 vessels (mostly large side trawlers of "Pioner" class and several processing ships) were located in 10-15 mile area 40 miles south of Nantucket Island. Heavy to moderate catches appeared to be primarily whiting (silver hake). The Soviets maintained a sizable fleet in that area since early September, but it had declined by late October. (2) A larger concentration, 30-40 vessels (mostly stern trawlers and some fish transports) were dispersed along the northern slopes and inner shoals of Georges Bank, 80 to 120 miles east of Cape Cod. Huge catches of fish, primarily herring, filled the open storage areas on the decks. Numerous trawls were bulging with catches estimated in excess of 30,000 to 40,000 pounds each. Most stern trawlers had their dehydration plants operating, an indication that they were also manufacturing fish meal and oil.

Soviet emphasis on catching herring in 1966 contrasted with their small herring catch on Georges Bank in 1965, but it was similar to their extensive herring fishing during August-September 1964.

Late in October, both fleet concentrations shifted. Those vessels fishing south of Nantucket Island moved north to the Cultivator Shoals area; most stern trawlers extended operations eastward beyond 100-fathom curve between northeast peak of Georges Bank and Browns Bank (south of Nova Scotia).

On October 11, the luxury tourist liner "Ivan Franko" was sighted about 12 miles east of Chatham, off Cape Cod (Massachusetts). This recently constructed ultramodern passenger vessel brought replacement crews for the factory stern trawlers fishing on Georges Bank and off Newfoundland. Several hundred fishermen were exchanged. Three stern trawlers, BMRTs "Topaz," "Safir," and "Perekat," fishing as far as Nova Scotia and Newfoundland, also came for replacement crews. The Ivan Franko, which came from Odessa, left 2 days later and returned home.

The fishery research vessel BMRT-395 "Atlant" fished about 5 miles east of the main group of vessels. No catch was observed.

Polish: Five factory stern trawlers were sighted on Georges Bank early in October operating among Soviet herring fleet. By mid-month, the trawlers had shifted to eastern Nova Scotia and Newfoundland fishing grounds.

East German: Two stern trawlers fished intermittently on Georges Bank during October, one of which first appeared early in September 1966. By month's end, both returned to their traditional fishing grounds off Canada.

Romanian: One stern trawler was sighted among Soviet fleets early in October.

IN GULF OF MEXICO

Soviet: No fishing vessels were sighted near U. S. coasts. Several large stern trawlers of "Tropik" class were sighted in Straits of Florida on way to newly opened Soviet fishing grounds in southwestern Atlantic off South American coast. Those vessels are based in the Havana fishing port, which became operational in early September 1966.

OFF PACIFIC NORTHWEST (Washington and Oregon)

Soviet: The fleet in October 1966 consisted of 70-80 vessels catching primarily hake. Observers noted more ocean perch and other rockfish in the catches than before.

During first-half October, greatest concentration of vessels was off Oregon; later, they moved back off Washington coast. For week ending October 27, 50 side trawlers and 14 factoryships were sighted off Washington

coast, and 8 stern and 1 factoryship off Oregon coast. The fleet moves between coasts of the two States seeking the greatest concentration of fish.

OFF ALASKA

Soviet: The fishing effort off Alaska in October 1966 continued to decline--from over 20 vessels early in the month to about 14 by month's end.

Pacific ocean perch operations in Gulf of Alaska were conducted by two stern factory trawlers off Southeastern Alaska throughout October. Two other stern trawlers were active in the Shumagin Islands area during first half of month.

Perch operations along Aleutian Islands were reduced from about 6 stern factory trawlers and a few support ships to 4 stern trawlers and a refrigerator vessel located south of Fox Islands in eastern Aleutians at month's end.

Soviet shrimping in the Shumagin Islands declined from 7 medium freezer trawlers and a few support ships in early October to about 5 medium trawlers by month's end.

Japanese: The vessels off Alaska declined to about 14 by mid-October and remained at about that level.

The decline of factory trawlers fishing for ocean perch in Gulf of Alaska continued. By October's end, only 3 vessels remained: the "Kirishima Maru" off coast of Southeastern Alaska, and the "Akebono Maru No. 72" and the "Daishin Maru No. 12" on Albatross Bank.

A new factory trawler, the "Zuiyo Maru No. 2," arrived south of Fox Islands in early October and fished for ocean perch. Later, she was joined by two factory trawlers, the "Tenyo Maru No. 3" from Japan and the "Kyo-shin Maru No. 55" from the Gulf of Alaska.

The king crab fleet in the eastern Bering Sea achieved its quota and ended operations by mid-October.

Long-line vessels fishing sablefish off Alaska increased from 2 in early October to 8 by month's end. Two long-liners, the "Tenyu Maru No. 18" and the "Tenyo Maru," were off coast of Southeastern Alaska. The

"Fukuyoshi Maru No. 15" was southwest of Chirikof Island. Four Japanese long-liners were north of eastern Aleutians--the "Kotoshiro Maru" No. 18, No. 25, No. 28, and No. 30. The "Fukuyoshi Maru No. 35" fished north of central Aleutians.

PACIFIC NORTHWEST

Boarding Soviet Vessel: On October 25, the U. S. Coast Guard and BCF officers boarded 2 Soviet vessels: one (the medium side trawler "Azimut") had lost her propeller screw; the other (the salvage tug "Dekabrist") towed the trawler into calmer waters off Neah Bay (in Strait of Juan de Fuca, Washington) where repairs could be made.

During boarding, the Soviet Fleet Commander, V. M. Sergeev, said Soviet fishery patrol vessels will strictly enforce compliance with the new U. S. fishery limit of 12 miles. Any Soviet vessel found within 12 miles of the U. S. coast will be punished with one week's loss of pay for crew. Soviet fishermen confirmed that fishing off Pacific Northwest was still good, but less so than earlier.

November 1966

IN NORTHWEST ATLANTIC

Soviet: During early November 1966, fishing and support vessels on Georges Bank fluctuated between 15 and 20, a marked decrease from the 50-60 during October 1966. By end of November, almost all vessels left the Georges Bank fishing grounds, most of them for southern part of Grand Bank (off Canada).

Fleet movements of this type are not uncommon at that time and the absence is probably only temporary. A similar decline occurred in 1965. But late in December, when the Soviets shifted operations to southern New England areas (Hudson and Block Canyon), the number increased again.

During November, 16 individual vessels were identified as 10 factory stern trawlers, 1 processing and refrigerated freezer trawler, 3 refrigerated fish transports, and 2 medium side trawlers. This compares with 72 vessels sighted during October 1966 and 16 in November 1965. The vessels were scattered along northern edge of Georges Bank (Georges Basin) and southwest slopes

of Browns Bank (Fundian Channel) 120 to 200 miles east of Cape Cod. Only limited catches of fish were observed. Based on visual observations, fleet location, and depth of water (100-160 fathoms), it appears that argentine (herring smelt) and possibly some mixed groundfish were principal species caught.

No Polish, East German, or Romanian fishing vessels were sighted on Georges Bank during November.

OFF MIDDLE AND SOUTH ATLANTIC

Japanese: A 1,000-ton trawler was reportedly exploring off the U. S. Atlantic coast, including waters from Newfoundland to Argentina. Initial explorations will seek out resources off Florida coast. Future plans depend on results.

Soviet: Fishing vessels were not sighted off Middle and South Atlantic coast in October-November 1966.

OFF ALASKA

Japanese: About 12 vessels were active off Alaska's coast during most of November.

The "Kirishima Maru" fished for Pacific ocean perch off Southeastern Alaska the first two weeks. It is believed she returned to Japan about mid-month and that the "Taka-chiho Maru" began fishing there shortly thereafter. The "Akebono Maru No. 72" and "Daishin Maru No. 12" fished for perch on Albatross Bank the first week. The "Akebono Maru No. 72" moved to north of central Aleutians during second week. It is believed the Daishin Maru No. 12 returned to Japan about mid-month. The "Ryuyo Maru" presumably began operations on Albatross Bank about mid-November. The "Tenyo Maru No. 3," "Zuiyo Maru No. 2," and "Kyoshin Maru No. 55" fished for perch south of Fox Islands in eastern Aleutians most of the month. The Tenyo Maru No. 3 docked at Seward near end of November to take on fuel and other provisions. The "Inase Maru No. 5" began perch operations north of central Aleutians in early November and was joined shortly thereafter by the Akebono Maru No. 72 from Gulf of Alaska.

The "Fukuyoshi Maru No. 15," a long-line vessel, fished for sablefish near Chirikof Island in Gulf of Alaska during first week. The long-liners "Kotoshiro Maru's" No. 18,

No. 25, No. 28, and No. 30 and "Fukuyoshi Maru No. 35" fished for sablefish along north side of eastern and central Aleutians during most of November. Those vessels may have returned to Japan by month's end.

Soviet: Its vessels ranged from 14 to 17, about the same as October.

Pacific Ocean perch operations in Gulf of Alaska were conducted by 4 large factory stern trawlers and 1 medium freezer trawler. Two of the stern trawlers fished off southeastern Alaska in early November and then, presumably, moved south.

Four stern factory trawlers, 1 medium side trawler, and 1 refrigerator carrier were active in the perch fishery south of Fox Islands in eastern Aleutians during early November. By month's end, only about 3 stern trawlers continued operations.

The Soviets doubled their effort in the Shumagin Islands shrimp fishery. Their vessels increased from 5 trawlers in early November to 9 trawlers, 1 refrigerated carrier, and 1 tanker by month's end.

OFF PACIFIC NORTHWEST (Washington and Oregon)

Soviet: Number of vessels ranged between 61 and 75. The greatest number worked off Washington coast from Grays Harbor to Cape Flattery, with major effort off Point Grenville and Destruction Island. From 40 to 65 vessels were sighted at one time off the Washington coast; off Oregon, the greatest number was 13.

Off Oregon the Soviets operated stern ramp trawlers and caught primarily Pacific hake, but catches were not as good as those further north.

The fleet had been following the seaward migration of hake so vessels in November were 15 to 30 miles off coast. They still were making fair-to-good catches.

Japanese: One 550-gross-ton trawler was dispatched from Japan on December 1, 1966, to work southward from waters off northern Washington to San Diego, California. The trip will last 4 months and involve about 90 days of actual fishing. The same vessel explored off Vancouver Island, British Columbia, in October and early November and took some Pacific hake and rockfish.



ARTICLES

HISTORY OF SCALLOP AND CLAM EXPLORATIONS IN THE GULF OF MEXICO

By James S. Carpenter*

Extensive scallop and clam resources have been outlined during BCF explorations in the Gulf of Mexico during the past 9 years. Greatest concentrations of calico scallops (*Aequipecten gibbus*) were off Cape San Blas, Fla., Gulf Shores, Ala., and St. George, Fla., in waters shallower than 20 fathoms. Productive beds of hard clams (*Mercenaria campechiensis*) were found off Pas-a-Grille, Venice, San Carlos, and Cape Romano, Fla., in 3 to 4 fathoms.

Small concentrations of paper-shell scallops (*Amusium papiraceus*) and Gulf clams (*Pitaria cordata*) were discovered offshore in the northwestern Gulf, from Ship Shoal, La., to Laguna Madre, Mexico.

Since 1954, BCF research vessels have carried out intermittent scallop and clam explorations in the Gulf of Mexico--primarily to locate clam and scallop beds on the Continental Shelf and to develop more effective harvesting methods. Another aim has been to determine if clams are again abundant in areas where, formerly, they were taken in large commercially significant amounts. This report documents commercial fishing efforts in the Gulf, outlines exploratory work accomplished, and indicates steps needed to continue the development of a commercial scallop and clam industry. Background material on early calico scallop explorations by BCF's research vessels and commercial fishing vessels was extracted from Bullis and Ingle (1959).

CALICO SCALLOPS

When the Tortugas shrimp grounds were discovered and fished in late 1949 and early 1950, the shrimp trawls took relatively large amounts of calico scallops (*Aequipecten gibbus*). The interest of the fishing industry was stirred, but only momentarily. Scallop catches decreased as the shrimp grounds were more closely delineated and fewer try nets were dragged in shallow water; the fleet then caught few scallops.

The first explorations specifically for commercial concentrations of scallops in the Gulf were conducted in April 1954 by BCF's

exploratory fishing vessel "Oregon" off southwest Florida (table 1). A modified, 4-foot, Biloxi-type oyster dredge and 40-foot shrimp trawls were used. No scallops were caught, although the Oregon dragged where its shrimp trawls had taken scallops in 1951. Apparently the scallops had either moved or died.

In July and August 1955, the commercial trawler "Goodwill" explored north of the Middle Grounds as far west as Cape San Blas. Several try-net drags, south of Cape St. George, caught calico scallops in 25 to 50 fathoms. The number of good-size scallops indicated that an extensive bed lay between the offings of Cape San Blas and Cape St. George.

The commercial vessel "Debbie K." explored the 10- to 30-fathom area off Panama City and Apalachicola, Fla., for scrap fish in fall 1955. It found calico scallops heavily concentrated in several areas; and it stopped trawling in some places because the large scallop catches impeded the efficiency of fish trawls. A catch of 25 bushels was brought to Panama City for shucking and marketing trials, but the facilities were not capable of handling it.

To supplement the rather uncertain supply of bay scallops (*Aequipecten irradians concentricus*) and to allow a longer period of production each year, a fishing firm in Pan-

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Table 1 - Bureau of Commercial Fisheries Explorations for Scallops and Clams in the Gulf of Mexico

Research Vessel	Cruise No.	Date	Area Covered	Type Gear Used
Oregon	22	3/31-4/23/54	Northeast and eastern Gulf	Oyster dredge and shrimp trawl
Oregon	43	2/5-2/21/57	North-central to eastern Gulf	Scallop dredge
Oregon	44	3/5-3/21/57	North-central to northwestern Gulf	Scallop dredge
Silver Bay . . .	2	7/12-7/29/57	Northeast and eastern Gulf	Scallop dredge
Silver Bay . . .	3	8/14-8/29/57	Northeast and north-central Gulf	Quahog dredge
Silver Bay . . .	10	7/17-8/3/58	Northeast and north-central Gulf	Scallop dredge
Silver Bay . . .	13	1/13-1/15/59	Northeast Gulf	Shrimp and midwater trawls
Oregon	67	5/27-6/2/60	North-central Gulf	Scallop trawl
Oregon	68	7/12-7/18/60	North-central Gulf	Scallop trawl
Oregon	70	9/6-9/23/60	North-central Gulf	Scallop trawl
Oregon	81	9/11-10/2/62	North-central and northwestern Gulf	Tumbler and quahog dredges
Oregon	83	11/28-12/21/62	Northeast Gulf	Tumbler and quahog dredges

ama City, Fla., began small-scale exploratory fishing for calico scallops offshore early in 1956. It made monthly trips to locate scallops and to observe their size and growth.

In February 1957, the Oregon made 54 scallop dredge drags between Pensacola and Cape St. George; the BCF-chartered vessel, "Silver Bay," continued the work in July and completed about 30 drags between Cape San Blas and Cape St. George. The gear used was an 8-foot, "Georges Bank" type sea-scallop dredge, constructed with 2-inch rings. The best catch was 6 bushels per 30-minute drag, but it was discovered later that 80 to 90 percent of the Silver Bay's scallop catch was being lost through spaces between the rings. Comparative drags made in August with this gear, which had been equipped with a 2-inch-stretched-mesh liner, took capacity catches (about 40 bushels) per 15-minute drag.

During the 1957-58 winter, vessels of the Panama City firm found rather dense populations of small scallops extending about 25 miles south-southeast of St. Andrews Bay. The bed lay in 6 to 20 fathoms, was 5 to 10 miles wide, 10 miles long, and was apparently the same one found by Debbie K. It extended 3 miles west of St. Joe Buoy to south of St. Andrews Bay Old Pass. There were heavy concentrations of scallops but they were not large enough for commercial use until February 1958. In March 1958, two Panama City boats started working the grounds. Four boats worked in early April. Catches were landed in Panama City, and all scallops were shucked by hand. One tub of unshucked scallops (about 500) yielded about 5 pounds of meats. A gallon of meats was produced by $1\frac{3}{5}$ tubs of scallops. Production of scallop

meats during spring and summer 1958 was 1,200 to 2,000 gallons per week.

Fishing was no longer considered profitable in September 1958 because of the poor market for scallops and the large number of scallop meats needed to produce a pound of meat. The size of the adductor muscle appeared to decrease during and after spawning. In late summer, presumably after spawning, the animals die. These conditions made enlargement of the fishery unattractive, and no boats joined the fleet of four.

Although they were produced in limited numbers as early as 1958 in the Gulf, calico scallops were grouped with and shown as bay scallops in "Fishery Statistics of the United States" until 1962; therefore, the true value of the calico harvest cannot be given before 1962. It is known, however, that the stocks discovered by the Oregon and Silver Bay were fished commercially in 1958; production was 102,500 bushels with ex-vessel value of \$102,500. Production of calico scallops in 1962 was 3,935 bushels, valued at \$4,882 (Power and Lyles, 1964). In 1963, production was only 50 bushels, valued at \$44 (Lyles, 1965).

HARD CLAMS

Schroeder (1924) reported that probably the largest bed of hard clams (*Mercenaria campechiensis*) in the United States was off southwest Florida near Ten Thousand Islands. He estimated a bed about 40 miles long and 5 miles wide, with area of 150 square miles. Continued explorations by BCF vessels have shown this bed extends from Ten Thousand Islands area to St. Petersburg, and that an area of about 200 square miles now produces

clams. The shoreline slopes very gradually and the depth is less than 12 feet in many places 4 to 5 miles offshore (Tiller, Glude, and Stringer, 1952). In 1943, a fishery marketing specialist of the U. S. Fish and Wildlife Service visited the Ten Thousand Islands area. He estimated potential production was almost unlimited and an abundance of 1 bushel of clams per 6 square yards dredged (Tiller, et al., 1952).

Although hard clams had been fished for many years in the Gulf with rakes, hoes, tongs, grabs, and by hand for home consumption, they were not fished commercially until the late 1880s. From 1889 to 1915, Key West boats made occasional trips to the Ten Thousand Islands area to harvest clams during the spring, summer, and fall. Catches landed in Key West varied from 10,000 to 25,000 clams annually. The average weight of a clam was 1 pound (Schroeder, 1924).

The clam stocks of the Ten Thousand Islands area were fished commercially with a conveyor-belt dredge (continually modified and improved) from 1913 to 1947. The dredge was essentially a large woodenscow, about 30 by 80 feet, with a rectangular opening in the bottom through which the dredge belt operated. Clams were washed from the bottom by high-pressure jets of water and brought to the surface by a conveyor belt (Tiller, et al., 1952). Clams taken by the dredge were shucked and used for canned chowder, minced clams, and clam juice. "The annual catch of the dredge from 1943 to 1946 was 30,000, 50,000, 78,000, and 25,000 bushels. In 1947, clams were so scarce that operations halted" (Tiller, et al., 1952).

Hard clams have been found also from Charlotte Harbor to lower Tampa Bay and Clearwater, but most beds are small and clams are taken only for home use. At one time, Matanzas Inlet, Charlotte Harbor, and inshore waters near Englewood supported small fisheries, but when the beds were depleted, the operations became unprofitable (Tiller, et al., 1952).

Despite the well-established fishery for hard clams off southwest Florida during the 1920s, commercial harvesting through 1960 fell to less than 20,000 pounds annually (Rosen and Robinson, 1961). This amounted to 2,923 bushels valued at \$5,462 (Power, 1963). Although an upsurge in the industry in 1962 netted 26,664 bushels for \$50,172 (Power and

Lyles, 1964), the increase was only temporary; the harvest dropped to 874 bushels, valued at \$2,331, in 1963 (Lyles, 1965).

EXPLORATORY FISHING AND GEAR METHODS

During BCF explorations, scallops were harvested with modified 5- to 8-foot scallop and tumbler dredges, described by Posgay (1957) and Bullis and Cummins (1961), and 25-foot scallop trawls similar to those described by Rivers (1962).

Hard clams were fished with modified 13-, 14-, and 22-tooth "Fall River" dredges with 2-inch-stretched-mesh liners.

Most drags for both scallops and clams were for 15 or 30 minutes. Dragging speeds varied between 2 and 2½ knots.

The Oregon and Silver Bay searched for scallops and clams. Both vessels have relatively deep drafts and could not explore for clams in shoal water areas inside 3 fathoms.

EXPLORATIONS

Calico Scallops

Although BCF and commercial-vessel explorations in the early 1950s disclosed calico scallops, commercially significant catches were not made until 1957. In February and July 1957, the Oregon and Silver Bay, using scallop dredges in 17 to 25 fathoms off Cape San Blas, made several promising catches.



Fig. 1 - About 15 bushels of calico scallops dumped from Georges Bank scallop dredge onto deck of Silver Bay.

As a result, BCF planned future explorations there.

In July 1958, the Silver Bay made 43 drags with scallop dredges in the Cape San Blas area and caught almost 20,000 pounds, or about 275 bushels of scallops (fig. 1). Eleven 15- to 30-minute drags, centered around lat. $29^{\circ}51' N$, long. $85^{\circ}35' W$, caught over 211 bushels; 1 drag netted 40 bushels, and 2 drags 30 bushels each. Scallops were concentrated at 11 fathoms. The main bed appeared to run 10 miles in northerly direction to south of Panama City. The scallops averaged about $2\frac{1}{2}$ inches in diameter, yielded about 2 quarts of meats per bushel. Scallops averaging $2\frac{3}{4}$ inches in diameter were present in deeper water. Texture and taste were comparable to northern bay scallop. Bullis and Ingle (1959) also reported high catch rates for commercial boats during same period. In 1959, however, that area was almost completely devoid of scallops; commercial operations were abruptly curtailed.

In July 1958, the Silver Bay dragged about 20 miles east-southeast of Cape St. George and discovered an extensive bed of scallops.

They averaged 1 inch in diameter, in 10-15-fathom depths. Catch ranged from 1 to 40 bushels per 30-minute drag. A less extensive bed of small scallops, $\frac{3}{4}$ to 1 inch in diameter, was found midway between Mobile, Ala., and Pensacola, Fla., in 10 to 15 fathoms.

In January 1959, the Silver Bay located an extensive bed of 1 to $1\frac{1}{2}$ -inch scallops between Mobile and Pensacola in 16 to 20 fathoms. On two cruises in 1960, off Gulf Shores, Ala., the Oregon made commercially significant catches. Scallops were fairly evenly distributed between 15 and 17 fathoms, but extensive, heavy concentrations were not located. In July 1960, 19 drags in 15 to 17 fathoms caught 2,680 pounds, or 38 bushels; in September 1960, 4 drags in 16 fathoms took 52 bushels; one 30-minute drag caught 40 bushels.

To summarize, 556 stations have been made with scallop gear (fig. 2), and calico scallops have been found at 145 localities (fig. 3). Heaviest concentrations were off Cape San Blas, Fla., and south of Gulf Shores, Ala., in less than 20 fathoms; maximum production came from 11 fathoms. A few calico scallops were taken east-north-

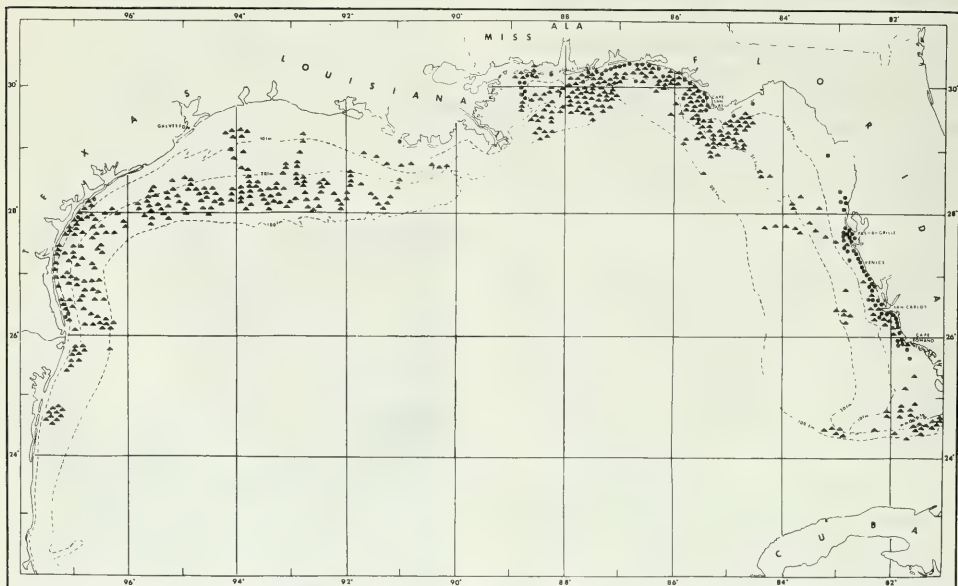


Fig. 2 - Fishing effort in the Gulf of Mexico, using scallop and clam gear, 1957-62. The triangles show where scallop gear was used and the dots where hard clam gear was fished.

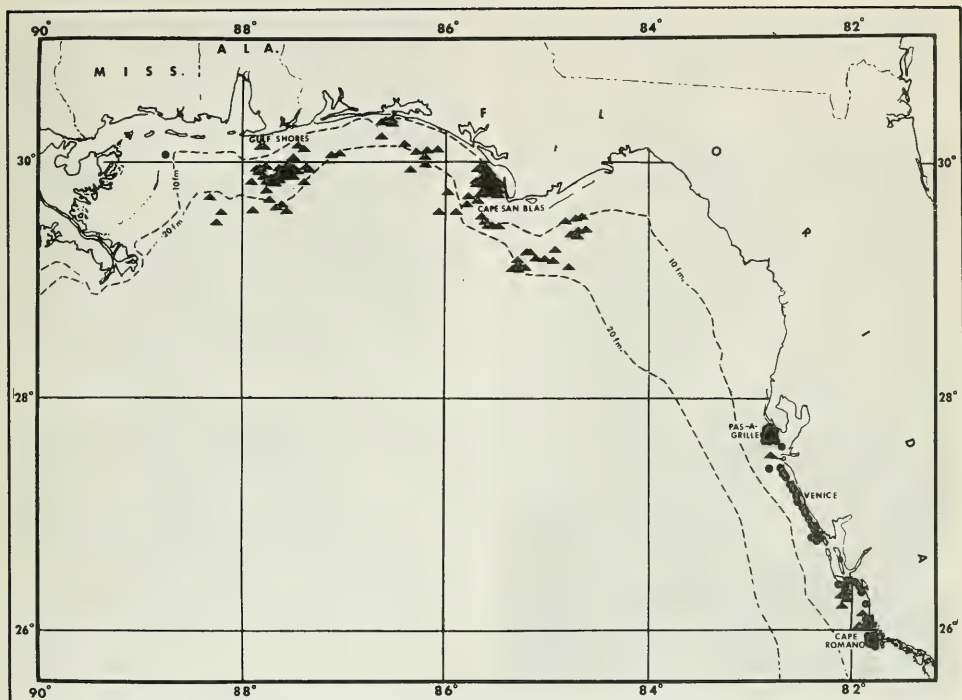


Fig. 3 - Calico scallop and hard clam occurrence in the Gulf of Mexico, 1957-62. The triangles shown where calico scallops were caught and the dots where hard clams were taken.

east of Cape Sable, Fla., south-southeast of Cameron, La., and off Galveston and Brownsville, Tex., and Laguna Madre, Mexico.

Bullis and Ingle (1959) made preliminary studies on growth rate and seasonal yield of scallops taken by commercial vessels. They found the maximum shell diameters had two well-delineated size groups that probably represent year classes. Shell sizes ranged from 0.6-1.0 inch for 1-year-olds and 1.8-2.5 inches for 2-year-olds. This indicates tentatively that scallops grow about 1 inch per year. Their study showed that scallops of commercial size have meats with about $\frac{1}{2}$ - to 1-inch diameters. It is difficult to study the growth of known scallop populations, which apparently move about. Additional studies are needed to learn more about growth rate and seasonal yield, determine seasonal availability, and to investigate the apparent movement and disappearance of well-defined concentrations from year to year.

Inshore Hard Clams

Hard clam (*Mercenaria campechiensis*) explorations have been conducted separately and with scallop explorations since 1957. Of 221 stations fished with clam gear (fig. 2), hard clams were found at 110 stations between St. Petersburg and Cape Romano, Fla. (fig. 3). The most productive beds were located off Pas-a-Grille, Venice, San Carlos, and Cape Romano. Best catches were made in 3' to 4 fathoms in the Pas-a-Grille and Venice areas in summers of 1957-58 (fig. 4). In August 1957, the Silver Bay took hard clams in 23 drags using quahog dredge between Sand Key and Gasparilla Island. The best catch (300 small clams--about 1 bushel per 30-minute drag) was confined to areas off Pas-a-Grille and Venice, Fla. Seventy percent of the catch consisted of 2-inch clams (little necks), with the remainder 3- to 4-inch cherrystones. Yield was about 1 gallon of meats per bushel. These clams were compa-

rable in quality to the northern quahog in taste, texture, and size. But it was difficult to keep them alive aboardship.

In July 1958, the Silver Bay caught hard clams in 47 scallop dredge drags between Cape Romano and Anclote Keys. Best fishing was again off Pas-a-Grille and Venice. The beds were still extensive, and the clams were about an inch larger than the previous summer. Twelve drags in the Pas-a-Grille area caught 20 bushels of clams; one 5-minute drag caught 1 bushel. Three drags made south of Venice yielded 7 bushels of clams, ranging from 2 to 4½ inches; 75 percent of the catch was made up of 3-inch clams. Yield was about 1 gallon of meats per bushel.



Fig. 4 - Modified Fall River type dredge with 3 to 4 bushels of hard clams being brought aboard Silver Bay.

Clam beds were located in the San Carlos and Cape Romano areas. These beds were not extensive and most catches were considerably less than those off Pas-a-Grille and Venice. Clams were kept alive for 15 days with negligible losses in a wooden tank, in which sea water was circulated continuously.

In December 1962, when the Oregon checked the beds' stability, clam populations had decreased in all four areas. Sixteen drags in the San Carlos and Cape Romano areas produced only 1 bushel of clams.

Twenty-two drags in the Pas-a-Grille area caught less than 10 bushels of 3- to 5-inch clams; 12 drags in the Venice area caught 4 bushels of the same size. Clams were generally scattered. There were only sporadic heavy patches.

From St. Petersburg to Marco Island, sampling was difficult because parchment worm (*Chaetopterus* sp.) tubes and heavy beds of pen shells (*Atrina rigida*) clogged the dredges' teeth and greatly reduced efficiency. Hard sand and coral fragments also hampered dredging in many areas. An exploratory cruise by the Silver Bay (Cruise 10) suggested modern hydraulic dredging techniques would be required to evaluate the Gulf's hard-clam potential.

Although BCF vessels have found commercial concentrations of hard clams only in Florida waters of the Gulf, fishermen and State personnel have reported, occasionally, that the Ship, Horn, and Chandeleur Island areas of Mississippi and Louisiana have small clam populations. In 1958, the Silver Bay was unable to locate them on the islands' outer side. Only 3 drags, 1 off Chandeleur Island, La., and 2 off Galveston, Tex., by BCF vessels have caught clams outside Florida waters. In June 1960, the Mississippi Gulf Coast Research Laboratory's shallow-draft vessel "Hermes" found a small bed of 5- to 6-inch clams in shoal waters inside Horn Island, Miss.

Offshore Scallops and Clams

In October 1960, the Oregon took up to 1 bushel per drag of paper-shell scallops (*Amusium papyraceus*) measuring 2 to 3 inches in diameter in 14 shrimp-trawl drags in 30 to 50 fathoms between Grand Isle, La., and Brownsville, Tex. Although these scallops were caught during 10 earlier cruises, this was the first indication that this species might have a commercial potential.

Table 2 - Catch of Gulf Clams (*Pitaria cordata*) and Paper-Shell Scallops (*Amusium papyraceus*) Taken by Oregon Between Ship Shoal, La., and Laguna Madre, Mexico, September 1962

Drags and Species	Depth Range (Fathoms)							
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80
	(Number)							
Drags made	27	43	81	50	20	6	2	2
Gulf clams								
(<i>Pitaria cordata</i>)	0	17	44	23	10	1	0	1
Paper-shell scallops								
(<i>Amusium papyraceus</i>)	0	2	41	42	10	0	0	0
Total	27	60	125	92	30	6	2	3

In September 1962, BCF explored for off-shore mollusks along the midshelf area of the northwestern Gulf. Between Ship Shoal, La., and Laguna Madre, Mexico, drags were made with tumbler dredges at 231 stations in 4 to 80 fathoms (table 2). The stations were set at predetermined intervals along a series of transectional legs so the 15- to 30-minute drags would provide adequate coverage.

Paper-shell scallops and small Gulf clams (*Pitaria cordata*) were taken although concentrations were generally small. Both species showed apparent preferential depth range of 21 to 50 fathoms (table 2).

FUTURE OF THE FISHERIES

Although Florida now has practically no commercial fishery for calico scallops or hard clams, BCF explorations have indicated commercial quantities of scallops in local-

ized areas. However, additional exploration, particularly in shallow-water areas, is needed before conclusions can be reached on the size and importance of hard-clam stocks.

Although the scallop and clam industries have had their ups and downs (production now is low) their future is promising. As public continues to increase consumption of sea food, price and demand for shellfish will warrant increased catches, and mechanical shuckers and eviscerators will eventually lead to reestablishment of Florida's scallop fishery. Tiller, et al., said of hard clams in 1952: "Restoration of the Ten Thousand Islands stocks might offer an opportunity for the development of a market for shucked frozen meats to be used by northern canneries, or perhaps for locally-canned clam products."

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BACTERIOLOGICAL CONTROLS FOR PRODUCING HIGH-QUALITY BREADED SEAFOODS

By Travis D. Love*

This report outlines methods, materials, and the interpretation of results that would permit the average plant technologist to provide valuable data to management on inplant bacteriological controls for breaded seafood products. These data, when properly applied, will help produce a high-quality breaded seafood product with an extended shelf life.

The Pascagoula Technology Laboratory offers a free laboratory refresher course to train the fishery plant technologist. In general, 1 week is enough to acquaint the average graduate (college) technologist or bacteriologist with the special problems and methods for inplant bacteriological controls. Training in the interpretation of results is an important part of this course.

It is essential that plant managers who wish to set up an inplant bacteriological control program employ a technologist or bacteriologist with college training in bacteriology. High school graduates may be trained to make bacteriological plate counts and other determinations; however, their work should be closely supervised by a person trained in theory and in interpretation of results. It would be wasteful to pay an inadequately trained person to use expensive materials and equipment to produce data of questionable validity.

Bacteriological Methods

Officially published methods should always be closely followed to obtain valid results. The plant bacteriologist should have these manuals for day-to-day reference:

Standard Methods for the Examination of Water and Waste Water, APHA, 12th ed., 1965.

Recommended Methods for the Microbiological Examination of Foods, APHA, 1958.

A Manual of Microbiological Methods by the Society of American Bacteriologists, McGraw-Hill Book Co., 1957, New York, N.Y.

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¹/The use of brand names does not imply endorsement of a firm's products to the exclusion of other products of suitable quality.

A Manual of Determinative Bacteriology, Bergey's, 7th ed., Williams and Wilkins, Baltimore, Md.

Microbiology of Foods, Tanner, Garrad Press, Champaign, Illinois.

Our Laboratory will provide technical advice at all stages of a plant's installation of a bacteriological controls program. Pascagoula bacteriologists have prepared three papers on inplant and laboratory studies on microbiological flora of breaded frozen seafood products: Carroll, Love, Ward, and Waters (1966); Reese, Carroll, Ward, and Garrett (1966, in press); and The Proceedings of the Fresh Iced Shrimp Symposium, April 1966. These papers are free to seafood-processing plants and may be obtained on application to the Laboratory. In addition to our personnel, supervisory personnel of the USDI Fishery Products Inspection Service are also trained to provide information on installing a bacteriological controls program.

Equipment and Materials

Minimum equipment for an inplant bacteriological control program can be obtained for \$1,600-\$2,000, exclusive of laboratory furniture. The following equipment is essential to the proper performance of the necessary counts and determinations:

Microscope, monocular, with oil immersion objectives and eye piece up to 950 diameters (Figure 1).

Incubator (Figure 2).

Large pressure cooker for 15 pounds steam (Micro-matic or Presto are suitable)¹/ (Figure 3).

Waring blender with 12 aluminum screw-cap, 1-quart jars. (Figure 4).

Harvard double-pantrip balance with gram weights.

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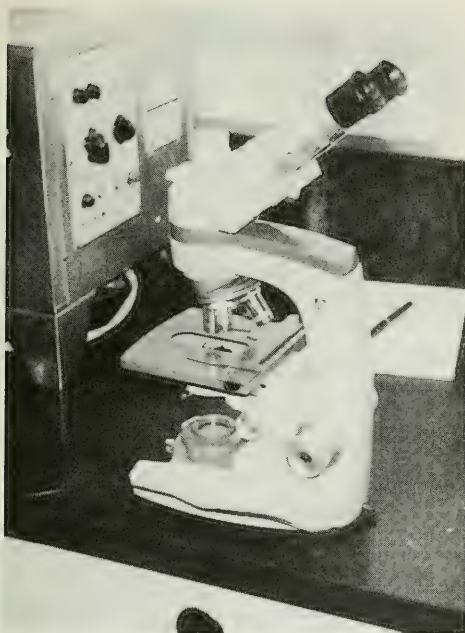


Fig. 1 - Microscope.



Fig. 3 - Pressure cooker.

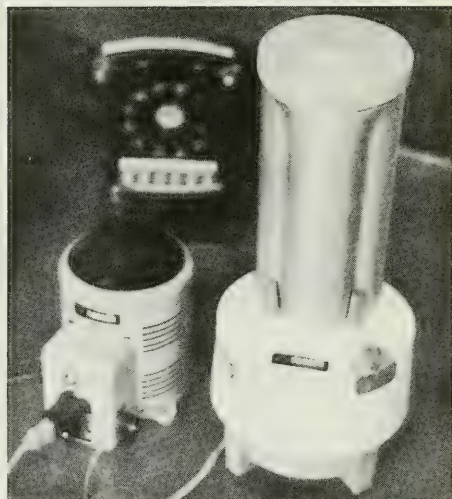


Fig. 4 - Waring blender.

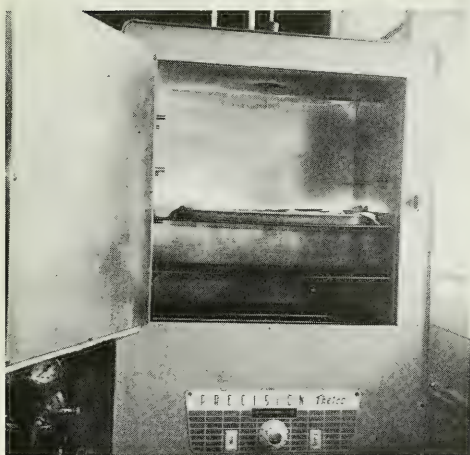


Fig. 2 - Incubator.

5 dozen assorted pyrex Erlenmeyer flasks.

100 pyrex dilution bottles, 100 ml.

Quebec colony counter (Figure 5).

Refrigerator, standard, household (Figure 6).

Quick freeze, small household type.

750 test tubes, 13 mm.; pyrex, screwcap (Figure 7).

Assorted small items such as micro slides, inoculating loops, cotton, gauze, forceps, stains, counters, stop watch, etc.

Pipette, bacteriological, 100, graduated, 10 ml.

Petri dishes, disposable, plastic, 2 cases, 750 each.

Media, bacteriological 15 pounds assorted (Difco or BBL suitable).

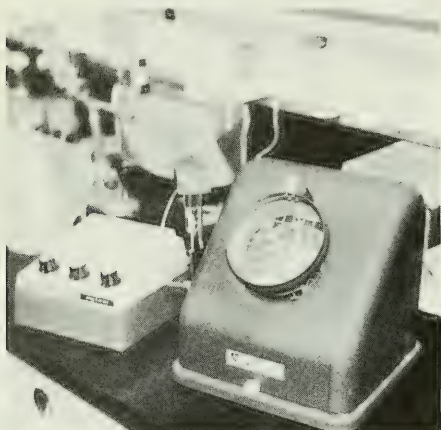


Fig. 5 - Quebec colony counter.

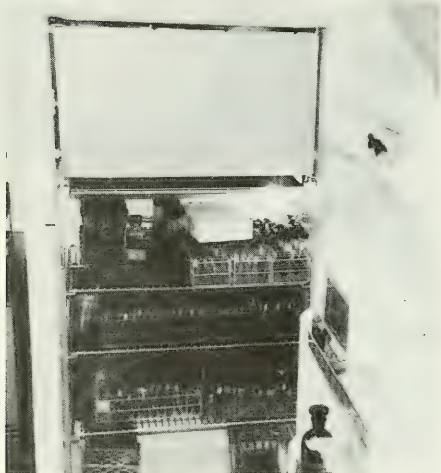


Fig. 6 - Refrigerator.



Fig. 7 - Test tubes and pipette cannisters.

The listed items can be purchased from warehouse stocks of any laboratory supply firm--such as, but not limited to, Curtin, Fischer, Sargent, or Thomas.

Interpretation of Results

One should be cautious in comparing and interpreting results of implant studies. Bacteriological counts and most-probable-numbers may vary widely because of variations in raw materials. High counts are often found in raw materials of good quality; they may influence those of the finished product.

Increases in total plate counts and the number of bacteria of public health significance should be controlled. Examination of production-line samples will pinpoint processing practices that tend to cause large increases of undesirable microorganisms.

For the average plant, a determination of total aerobic plate counts, most-probable-numbers of the coliform group, numbers of fecal types of *Escherichia coli*, and the numbers of coagulase-positive *Staphylococcus* will provide sufficient data to evaluate the processing practices and sanitation of the plant. Studies at the Pascagoula Technology Laboratory indicate that each frozen breaded seafood has its own limited microbiological flora.

Because of the increased use of bacterial counts as an index of sanitation by State and Federal regulatory agencies, it is of prime importance that plant managers control, and have data on, the bacterial flora of their products. The State and Federal regulatory agencies are discussing mandatory bacteriological standards for all frozen foods. We may find, however, that blanket standards proposed for frozen raw foods are difficult to comply with

in commercial practice. So plant managers and the Bureau of Commercial Fisheries ought to obtain data on production-line samples that

will make possible the formulation of satisfactory standards for each product.

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BENJAMIN Q. WARD; and MELVIN E. WATERS.
1966. Microbial analyses of frozen raw breaded shrimp, Fish.
Ind. Res., 3(3).

REESE, GLADYS B.; BOBBY J. CARROLL;
BENJAMIN Q. WARD; and EPHRIAM S. GARRETT, III.
1966. Examination of precooked frozen seafoods for the presence of microorganisms of public health significance (in press).



CANNED SALMON PLENTIFUL AND NOURISHING



Salmon has helped nourish members of the human race since prehistoric times. Today, thanks to modern canning methods, salmon is widely known as a cosmopolitan food fish. Its delicious flavor, nutritional value, and the convenience of the easy-to-store, easy-to-use can are three good reasons for serving salmon frequently, says Harold E. Crowther, Acting Director of the Department of the Interior's BCF.

A heavy catch of salmon in 1966 will result in plentiful supplies of canned salmon during the coming Lenten season.

This recipe, developed by BCF's home economists, demonstrates a simple-to-prepare canned salmon entree.

For menu suggestions and some helpful hints in serving this tasty fish, write for the popular Bureau recipe booklet, "Take a Can of Salmon." This 17-page booklet, in color, is free from the Canned Salmon Institute, 618 Second Ave., Seattle, Wash. 98104.

SALMON CHOWDER

1-pound can salmon
1 chicken bouillon cube
1 cup boiling water
 $\frac{3}{4}$ cup chopped onion
 $\frac{1}{2}$ cup chopped green pepper
1 clove garlic, finely chopped
 $\frac{1}{4}$ cup butter or other fat, melted
 $\frac{1}{2}$ cup salmon liquid

1-pound can tomatoes
1 can (8 ounces) whole-kernel corn
1 cup sliced okra (optional)
 $\frac{1}{2}$ teaspoon salt
 $\frac{1}{2}$ teaspoon thyme
Dash pepper
1 whole bay leaf

Drain salmon, reserving liquid. Break salmon into large pieces. Dissolve bouillon cube in boiling water. Cook onion, green pepper, and garlic in butter until tender. Combine all ingredients and cook for 15 minutes or until vegetables are tender. Remove bay leaf. Serves 6.

PUBLICATIONS

FISH AND WILDLIFE SERVICE

These publications are available free from the Office of Information, U. S. Fish and Wildlife Service, Washington, D. C. 20240. Publications are designated:

CFS--Current fishery statistics of the United States.

FFL--Reprints of reports on foreign fisheries.

FL --Fishery leaflets.

Sep. --Separates (reprints) from Commercial Fisheries Review.

SSR,--Fish.--Special Scientific Reports--Fisheries (limited distribution).

Number	Title
CFS-4193--	Rhode Island Landings, March 1966 (Revised), 3 pp.
CFS-4203--	Michigan, Ohio & Wisconsin Landings, June 1966, 4 pp.
CFS-4212--	New Jersey Landings, July 1966, 3 pp.
CFS-4220--	Frozen Fishery Products, Aug. 1966, 8 pp.
CFS-4221--	Maryland Landings, July 1966, 4 pp.
CFS-4222--	Michigan, Ohio & Wisconsin Landings, July 1966, 4 pp.
CFS-4223--	Shrimp Landings, Apr. 1966 (Revised), 6 pp.
CFS-4224--	Gulf Coast Shrimp Data, Apr. 1966, 16 pp.
CFS-4235--	Shrimp Landings, May 1966, 5 pp.
CFS-4239--	California Landings, June 1966, 4 pp.
CFS-4243--	New York Landings, July 1966, 4 pp.
CFS-4244--	Maryland Landings, Aug. 1966, 4 pp.
CFS-4245--	Rhode Island Landings, June 1966, 3 pp.
CFS-4249--	Mississippi Landings, June 1966, 3 pp.
CFS-4251--	Louisiana Landings, Aug. 1966, 3 pp.
CFS-4252--	Maine Landings, July 1966, 4 pp.
CFS-4259--	Massachusetts Landings, May 1966, 9 pp.
CFS-4263--	Florida Landings, Sept. 1966, 8 pp.
CFS-4264--	Maine Landings, Aug. 1966, 4 pp.
CFS-4265--	Massachusetts Landings, June 1966, 10 pp.

CFS-4269--Shrimp Landings, June 1966, 5 pp.

Sep. No. 776--Hard-Clam Explorations Off Southeastern United States.

Sep. No. 777--Trends in Gulf of Mexico Shrimp Trawling Fleet.

FL-593--Graduate Educational Grants, Academic Year 1967-68, 5 pp., illus., Oct. 1966. The purpose of this program is to increase the number of high-caliber scientists trained for research in fisheries or in other fields relevant to fisheries. Contains information on the fields of study; stipend and duration of grant; obligations of grant tenure; and who, where, when, and how to apply. The institutions receiving awards will be required to comply with Title VI of the Civil Rights Act of 1964. Gives instructions for submitting applications, and date of announcements of awards.

SSR-Fish. No. 538--Distribution of Spawning Pink Salmon in Sashin Creek, Southeastern Alaska, and Survival of Their Progeny, by William J. McNeil, 15 pp., illus., September 1966.

Field Guide to the Synodontidae (Lizardfishes) of the Western Atlantic Ocean, by William W. Anderson et al., Circular 245, 12 pp., illus., May 1966. Illustrated keys, designed primarily for use in the field, are presented for the 3 genera and 10 species of lizardfishes, family Synodontidae, occurring in the western Atlantic Ocean.

The following Foreign Fisheries Leaflets are available free from the Branch of Foreign Fisheries, Bureau of Commercial Fisheries, Room 8015, U. S. Department of the Interior, Washington, D. C. 20240:

FFL-7--"Mexican Fisheries, 1965," discusses the principal developments in the Mexican fishing industry and foreign trade in fishery products during 1965.

FFL-22--"Republic of South Africa and Territory of South-West Africa Fisheries, 1965," consists of tables showing the production of processed fishery products for the Republic of South Africa and Mandated Territory of South-West Africa.

FFL-90--"Belgian Fishing Industry, 1965," contains information on landings; fishing grounds; derrick fishing; minimum price stabilization system; imports; exports; government policy; Benelux Union Agreement; the fishing fleet; labor; deep-freezing; outlook for 1966; and tables giving detailed fishery statistics by species and year.

FFL-103--"Japan's Fisheries Catch, 1965," summarizes Japan's fishery catch for 1956-1965; the catch of sea fisheries by type for 1961-1965; culture production for 1961-1965; and whaling for 1961-1965.

FFL-105--"Tanzania Fisheries, 1966," summarizes observations based on discussions with government fisheries officials, industry members, and others.

"Checklist of Reports issued by Branch of Foreign Fisheries (Sept. 1966)," a list of other Foreign Fishery Leaflets in this series.

Japanese Production and Exports of Marine Products, 1965. Translated excerpts from an article that appeared in the September 1966 issue of a Japanese periodical "The Cannery Journal". The report gives summary data on the production and exportation of canned salmon, canned tuna, canned crab meat, and other canned fishery products. This report is available on loan only to firms in the United States from the Branch of Foreign Fisheries.

The following publications are available only from the specific office mentioned:

California Fishery Market News Monthly Summary, Part I - Fishery Products Production and Market Data, Sept. 1966, 16 pp. (Market News Service, U. S. Fish and Wildlife Service, Post Office Bldg., San Pedro, Calif. 90731.) California cannery receipts of tuna and tunalike fish and other species used for canning; pack of canned tuna, tunalike fish, sardines, mackerel, and anchovies; market fish receipts at San Pedro, Santa Monica, and Eureka areas; California and Arizona imports; canned fish and frozen shrimp prices; ex-vessel prices for cannery fish; prices for fish meal, oil, and solubles; for the month indicated.

California Fishery Market News Monthly Summary, Part II - Fishing Information,

Sept. 1966, 13 pp., illus. (U. S. Bureau of Commercial Fisheries, Tuna Resources Laboratory, P. O. Box 271, La Jolla, Calif. 92038.) Contains sea-surface temperatures, fishing and research information of interest to the West Coast tuna-fishing industry and marine scientists; for the month indicated.

Dimensions and Shapes of Larvae of Some Marine Bivalve Mollusks, by Victor L. Loosanoff et al., 84 pp., illus., printed. (Reprinted from Malacologia, vol. 4, no. 2, 1966, pp. 351-435.) U. S. Bureau of Commercial Fisheries Biological Laboratory, Milford, Conn. 06460.

"Fish Farming--A Growing Industry", Fisheries Research and Services Newsletter. (U. S. Department of the Interior, BCF, 5 Research Drive, Ann Arbor, Mich. 48103.) Informs fish-farm producers, processors, buyers, and others interested in warm-water fish farming of research under way and planned by BCF and Bureau of Sport Fisheries & Wildlife. Answers queries from people now in production, those planning to enter catfish farming, and from legislators and government agencies.

(Seattle) **Washington and Alaska Receipts and Landings of Fishery Products for Selected Areas and Fisheries, Monthly Summary,** Oct. 1966, 8 pp. (Market News Service, U. S. Fish and Wildlife Service, 706 New Federal Office Bldg., 909 First Ave., Seattle, Wash. 98104.) Includes landings by the halibut fleet reported by the Seattle Halibut Exchange; salmon landings reported by primary receivers; landings of halibut reported by the International Pacific Halibut Commission; landings and otter-trawl receipts reported by the Fishermen's Marketing Association of Washington; local landings by independent vessels; coastwise shipments from Alaska by scheduled and nonscheduled shipping lines and airways; imports from British Columbia via rail, motor truck, shipping lines, and ex-vessel landings; and imports from other countries through Washington customs district for the month indicated.

MISCELLANEOUS

These publications are not available from the Fish and Wildlife Service, but usually may be obtained from the organization issuing them. Correspondence regarding publications that

follow should be addressed to the respective organization or publisher mentioned. Data on prices, if readily available, are shown.

AMERICAN SAMOA:

"A Pago-Pago (Samoa) --L'Exploitation des thoniers palangriers Coreens" (At Pago-Pago (Samoa) --fishing by Korean tuna long-liners), article, France Pêche, no. 110, October 1966, pp. 36-43, illus., printed in French. A single copy 2,50 F. (about US\$0.50). France Pêche, Boîte Postale 179, Lorient, France.

AMINO ACIDS:

"Balancing of amino-acid mixtures and proteins," by A. E. Bender, article, Chemical Abstracts, vol. 64, Nov. 8, 1966, Abstract No. 7111d, printed. American Chemical Society, 1155 16th St. NW., Washington, D. C. 20006.

ANGOLA:

"La pêche maritime en Angola" (The marine fisheries of Angola), by Y. Gheno, article, La Pêche Maritime, vol. 45, no. 1062, September 1966, pp. 635-640, illus., printed in French. La Pêche Maritime, 190 Boulevard Haussmann, Paris 8^e, France.

AQUATIC WEEDS:

"Aquatic weed control in Louisiana, by Virgil T. Lapham, article, Louisiana Conservationist, vol. 18, nos. 11 & 12, Nov.-Dec. 1966, pp. 2, 19-23, illus., printed. Louisiana Conservationist, Wild Life & Fisheries Bldg., 400 Royal St., New Orleans, La. 70130.

BELGIUM:

Rapport Annuel sur L'Evolution de la Flotte de Pêche (Annual Report on the Status of the Fishing Fleet in 1965), 43 pp., processed in French, 1965. Administration de la Marine et de la Navigation Interieure, Ministère des Communications et des Postes, Telegraphes et Telephones, Brussels, Belgium.

BRAZIL:

Informações à Indústria de Pesca (Information on the Fishing Industry), 1966, 79 pp., printed in Spanish. Grupo Coordenador do Desenvolvimento da Pesca/SUDENE, Documentação de Pesca, Edif. Entrepósito Federal de Pesca - 8^o Andar, Cais de Santa Rita, Recife, PE., Brasil.

CANADA:

Fisheries Research Board of Canada, vol. 23, no. 10, October 1966, pp. 1475-1634, illus., printed; single copy for Canada, U. S., and Mexico C\$1.00, other countries \$1.25. Fisheries Research Board of Canada, Sir Charles Tupper Building, Ottawa 8, Canada. Contains, among others, these articles: "Muscular fatigue and mortality in haddock, Melanogrammus aeglefinus, caught by otter trawl," by F.W.H. Beamish, pp. 1507-1521; "Some methods for estimating exploited populations," by K. Radway Allen, pp. 1553-1574; "Adjustment of buoyance in Atlantic salmon parr in relation to changing water velocity," by Nancy M. Neave, Carole L. Dilworth, J.G. Eales, and R. L. Saunders, pp. 1617-1620; "Feeding and growth of redfish (genus Sebastes) in captivity," by A. C. Kohler, pp. 1621-1623.

International Pacific Salmon Fisheries Commission Annual Report 1965, 42 pp., illus., printed, 1966. International Pacific Salmon Fisheries Commission, New Westminster, B. C., Canada.

CANNING:

"Fluorine content in canned fish," by Jozef Wierchowski and Barbara Wituszynska, article, Chemical Abstracts, vol. 63, Oct. 25, 1965, Abstract No. 12231b, printed. American Chemical Society, 1155 16th St. NW., Washington, D. C. 20006.

CARIBBEAN:

"La pesca del bonito en el Caribe" (Caribbean bonito fishery), by Vicente Cubillas, article, Puntal, vol. XIII, no. 148, July 1966, pp. 12-15, illus., printed in Spanish, single issue 20 pesetas (about US\$0.33). Puntal, Apartado do Correos 316, Alicante, Spain.

CHARTS:

The following charts are sold by Coast and Geodetic Survey Sales agents, district offices, and the Washington office. New editions contain information essential to safe navigation--and cancel former editions. Mariners are warned against using obsolete charts.

ALASKA--Southeast Coast--Dixon Entrance to Cape St. Elias, 9th edition of Chart No. 8002 issued Aug. 22, 1966, scale of 1:969,756. Price: \$1.75 a copy.

These publications are not available from the Fish and Wildlife Service, but usually may be obtained from the organization issuing them.

ALASKA AND ALEUTIAN ISLANDS

Nautical Chart Catalog, vol. III, lists all available nautical charts for Alaska, including the Aleutian Islands, completes the conversion of Nautical Chart Catalog to new format. Similar catalogs issued this year are: Volume I--covers the Atlantic and Gulf Coasts, including Puerto Rico and the Virgin Islands; Volume II--covers the Pacific Coast, from the Mexican to the Canadian borders, and Hawaii, Guam, and American Samoa. Catalogs are accordion-folded, lists the number of all charts, areas covered, chart prices, and scale of each chart. Both small craft and conventional charts are listed. Includes list of tide tables, coast pilots (sailing directions), current tables, and tidal current charts. Authorized nautical chart sales agents are listed in the catalog.

CALIFORNIA

San Miguel Passage, 3rd edition of Chart No. 5116 issued Sept. 12, 1966, scale of 1:40,000. Price: 75 cents a copy.

San Pedro Bay, 10th edition of Chart No. 5148 issued Sept. 26, 1966, scale of 1:18,000. Price: \$1.00 a copy.

San Francisco Bay--Southern Part, 17th edition of Chart No. 5531 issued Sept. 19, 1966, scale of 1:40,000. Price: \$1.00 a copy.

San Pablo Bay, 15th edition of Chart No. 5533 issued Oct. 3, 1966, scale of 1:40,000. Price: \$1.00 a copy.

Suisun Bay, 29th edition of Chart No. 5534 issued Sept. 19, 1966, scale of 1:40,000. Price: 75 cents a copy.

FLORIDA

Crystal River to Horseshoe Point--Suwannee River, 4th edition of Chart No. 1259 issued Aug. 1, 1966, scale of 1:80,000 and 1:20,000. Price \$1.00 a copy.

St. Andrew Bay, 6th edition of Chart No. 489 issued Sept. 19, 1966, scale of 1:25,000. Price: 75 cents a copy.

Everglades National Park--Whitewater Bay, 2nd edition of Chart No. 598SC issued Oct. 8, 1966, scale of 1:50,000. Price: \$1.00 a copy.

Everglades National Park--Shark River to Lostmans River, 2nd edition of Chart No. 599SC issued Oct. 8, 1966, scale of 1:50,000. Price: \$1.00 a copy.

Intracoastal Waterway Tolomato River to Eau Gallie, 4th edition of Chart No.

843SC issued Sept. 24, 1966, scale of 1:40,000. Price: \$1.00 a copy.

Intracoastal Waterway West Palm Beach to Miami, 5th edition of Chart No. 847SC issued Sept. 10, 1966, scale of 1:40,000. Price: \$1.00 a copy.

FLORIDA--ALABAMA--Santa Rosa Sound to Dauphine Island, 2nd edition of Chart No. 872SC issued Sept. 17, 1966, scale of 1:40,000. Price: \$1.00 a copy.

GEORGIA--St. Simons Sound Brunswick Harbor and Turtle Sound, 22nd edition of Chart No. 447 issued July 18, 1966, scale of 1:40,000. Price: 50 cents a copy.

LOUISIANA

Mississippi River Delta, 18th edition of Chart No. 1272 issued Aug. 1, 1966, scale of 1:80,000. Price: \$1.00 a copy.

Chandeleur and Breton Sounds, 6th edition of Chart No. 1270 issued Sept. 12, 1966, scale of 1:80,000. Price: \$1.00 a copy.

MAINE--Calais to West Quoddy Head, 5th edition of Chart No. 801 issued Sept. 12, 1966, scale of 1:40,000. Price: \$1.00 a copy.

MAINE-NEW HAMPSHIRE--Portsmouth Harbor Cape Neddick Harbor to Isles of Shoals, 4th edition of Chart No. 211 issued Aug. 1, 1966, scale of 1:20,000 and 1:10,000. Price: \$1.00 a copy.

NORTH CAROLINA--Cape Hatteras--Wimble Shoals to Ocracoke Inlet, 12th edition of Chart No. 1232 issued Aug. 29, 1966, scale of 1:80,000. Price: \$1.00 a copy.

TEXAS--Corpus Christi Bay, 8th edition of Chart No. 523 issued July 25, 1966, scale of 1:40,000. Price: \$1.00 a copy.

WEST INDIES--Puerto Rico--East Coast--Pasaje De Vieques and Radas Roosevelt, 3rd edition of Chart No. 940 issued July 25, 1966, scale of 1:25,000. Price: \$1.00 a copy.

CRAB(S):

"Canadian Atlantic crab resources," by D. G. Wilder, article, Fisheries of Canada, vol. 19, no. 3, September 1966, pp. 11-16,

These publications are not available from the Fish and Wildlife Service, but usually may be obtained from the organization issuing them.

illus., printed. Information and Consumer Service, Department of Fisheries, Ottawa, Canada. Summarizes available information on the fisheries for rock crab and spider crab in the Gulf of St. Lawrence and other crab species. Also discusses needs for further research, and examines possibilities for expanding the existing fisheries or developing new ones.

"Strong ships and hardy men harvest delicate king crab," article, Pacific Fisherman, vol. 63, June 1965, pp. 11-15, printed. Miller Freeman Publications, 71 Columbia St., Seattle, Wash. 98104.

DENMARK:

Fiskeriundersøgelser i 1963 ved Danmark, Færøerne og Grønland; 1965; (Marine Fishery Research in Denmark, the Faroes and Greenland: Reports for 1963, 1964, and 1965); by E. Bertelsen and Paul M. Hansen, Skrifter fra Danmarks Fiskeri - og Havundersøgelser no. 24, no. 25, and no. 26; 113, 84, 112 pp., respectively, illus., printed in Danish; 1964, 1965, and 1966, respectively; Kr. 9.75 (US\$1.50) each. I Kommission Hos Andr. Fr. Høst & Son, J. Jørgensen & Co. Bogtrykkeri, Copenhagen, Denmark. The 1965 report includes sections on possible protection for the dogfish; fluctuations in the yield of the North European tuna fisheries. The 1964 report discusses fish traps in Greenland; prevention of disease in trout ponds; and bubble-curtain research. Reports contain summaries of the fisheries in the Faroe Islands; and the 1964 and 1965 reports review research on cod, salmon, and shrimp in Greenland waters.

EUROPEAN ECONOMIC COMMUNITY:

"La Commission de la C.E.E. a publié son rapport sur les principes de base pour une politique commune des pêches" (EEC publishes its report on the basic principles for a common fishery policy), by P. Schmitz, article, La Pêche Maritime, vol. 45, no. 1062, September 1966, pp. 623-629, printed in French. La Pêche Maritime, 190 Boulevard Haussmann, Paris 8^e, France.

ENZYMES:

"Enzymic curing of drawn fish," by Jaroslav Albrecht et al., article, Chemical Abstracts, vol. 60, Feb. 3, 1964, Abstract No. 3424c, printed. American Chemical Society, 1155 16th St. NW., Washington, D. C. 20006.

FATTY ACIDS:

"Fatty acid changes in beef, pork, and fish after deep-fat frying in different oils," by R. A. Chung, J. A. McKay, and C. L. Ramey, article, Food Technology, vol. 20, May 1966, pp. 123-125, printed. The Garrard Press, 510 N. Hickory St., Champaign, Ill. 61820.

FISHERY RESEARCH:

"Fish population studies are important," by Otho D. May, Jr., article, South Carolina Wildlife, vol. 13, no. 4, Fall 1966, pp. 4-5, illus., printed. South Carolina Wildlife Resources Department, Box 167, Columbia, S. C. 29202.

FLORIDA:

A Field Key to the Batoid Fishes (Sawfishes, Guitarfishes, Skates and Rays) of Florida and Adjacent Waters, by Harold Wahlquist, Technical Series No. 50, 26 pp., illus., printed, July 1966. Marine Laboratory, Florida State Board of Conservation, Maritime Base, Bayboro Harbor, St. Petersburg, Fla. 33731.

FOOD AND AGRICULTURE ORGANIZATION:

Yearbook of Fishery Statistics, 1965 (Catches and Landings), vol. 20, 396 pp., illus., printed in French, Spanish, and English, 1966, US\$5.50. Food and Agriculture Organization of the United Nations, Rome, Italy. (Sold in United States by Columbia University Press, International Documents Service, 2960 Broadway, New York, N. Y. 10027.) The present issue brings up to date the world's annual statistics on fishery catches and landings by country, by species, and by major fishing areas previously published in volume 18. Data for 1965 have been added in all tables. Tables cover the catches or landings of all fish, crustaceans, molluscs, and other aquatic animals, residues and plants, made by commercial and subsistence fishermen operating in freshwater and marine areas. Mainland China remains the only fishing country with a significant catch that has not been reported since 1960.

Indo-Pacific Fisheries Council Proceedings,

11th Session, Kuala Lumpur, Malaysia, Oct. 16-31, 1964, Section II, Technical Papers, 331 pp., illus., processed in English, 1966, US\$1 (5s.). Indo-Pacific Fish-

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eries Council, FAO Regional Office for Asia and the Far East, Bangkok, Thailand. Full proceedings of the meeting consist of three sections. Section I is a "Report of the Proceedings" and Section III contains the papers read at the symposium. This section contains the technical papers on marine biology, fresh-water fish biology, fish culture, shellfish culture, craft, trawling, other fishing gear, fish processing, cooperatives, and statistics.

FREEZE-DRYING:

"Surface areas and densities of freeze-dried foods," by E. P. Berlin et al., article, Journal of Agricultural and Food Chemistry, vol. 14, January-February 1966, pp. 15-17, printed. Association of Agricultural Chemists, Box 450, Benjamin Franklin Station, Washington, D. C. 20044.

FREEZING:

"Alaskan fish freezing boom projected; could replenish U. S. fisheries," article, Quick Frozen Foods, vol. 28, Dec. 1965, pp. 131-132, 134, printed. E. W. Williams Publications, Inc., 1776 Broadway, New York, N. Y. 10019.

FROZEN FISH:

"Improvements in the thawing of frozen fish," article, Abstracts from Current Scientific and Technical Literature, vol. 18, abstract no. 1718, July 1965, p. 326, and vol. 18, abstract no. 2020, August 1965, p. 382, printed. British Food Manufacturing Research Assoc., Randalls Road, Leatherhead, Surrey, England.

FUNGI:

Observations on the Growth of the Marine Hyphomycete Varicosporina Ramulosa, by Samuel P. Meyers and Lydia Hoyo, Contribution No. 711, 7 pp., illus.; printed. (Reprinted from Canadian Journal of Botany, vol. 44, 1966, pp. 1133-1140.) Institute of Marine Science, 1 Rickenbacker Causeway, Virginia Key, Miami, Fla. 33219.

GEAR:

"West coast fishermen swear by stabilizers," by Tom H. Inkster, article, National Fisherman, vol. 46, Feb. 1966, pp. 47-51, printed. Journal Publishing Co., 66 High St., Belfast, Maine 04915.

GENERAL:

Fishes of the Western North Atlantic, by William W. Anderson et al., Memoir I, Part 5, 662 pp., illus., printed, 1966, \$27.50. Sears Foundation for Marine Research, Yale University, New Haven, Conn. 06520. This book is the fifth in a series. Deals with marine fish in the North Atlantic that extends from Hudson Bay to the Amazon. The fish described in this volume are not normally encountered by the inshore fisherman or the general public and since the material presented is purely taxonomic in nature, this book is not for laymen's use. To the professional ichthyologist and other students of marine zoology, however, it will be an indispensable reference.

GRANTS:

"Sea-grant college benefits to U. S. fishery compared to agriculture's gains under land-grant act," article, Fishing Gazette, vol. 83, Apr. 1966, pp. 38, 40, 64, printed. Fishing Gazette Publishing Corp., 461 Eighth Ave., New York, N. Y. 10001.

INDIAN OCEAN:

International Indian Ocean Expedition. Collected reprints III, 993 pp., illus., printed, mostly in English with some Dutch and Russian, 1966. United Nations Educational, Scientific and Cultural Organization, Place de Fontenoy, Paris-7^e, France. Comprises reprints received by UNESCO during the second half of 1964 and throughout 1965. The papers presented in the volume are roughly grouped into four major parts: I - Marine biology; II - Marine chemistry; III - Physical oceanography; IV - Marine geology and geophysics.

INTERNATIONAL COMMISSION FOR THE NORTHWEST ATLANTIC FISHERIES:

Statistical Bulletin for the Year 1964, vol. 14, 84 pp., printed, 1966. International Commission for the Northwest Atlantic Fisheries, Dartmouth, Nova Scotia, Canada. Volume 14 of the ICNAF Statistical Bulletin series presents statistical data on the fisheries carried out in 1964 in the Convention Area. In 1964, all member countries, except Italy, fished in the Convention Area and reported statistical data to the Secretariat. The statistics cover the nominal catch data (landings converted from landed weight to live weight) on an annual calendar

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year of capture basis. Part I presents revised summaries of the catch statistics for all species and for major species for the years 1952-64.

INTERNATIONAL COMMISSION ON WHALING:

Sixteenth Report of the Commission (covering the sixteenth fiscal year 1st June, 1964 to 31st May, 1965), 73 pp., illus., processed, 1966. Office of the International Whaling Commission, Whitehall Place, London, S.W. 1, England. The report refers to the Sixteenth Meeting of the Commission held in Sandefjord, Norway, June 1964, Special Meeting of the Commission held in London May 1965, and meeting of the Scientific Committee held in London June 1965, to assess the results of the 1964/65 (Antarctic) and 1964 (outside Antarctic) whaling seasons.

IRRADIATION:

"Commercialization of irradiated foods," by Robert J. McClusky, article, Food Processing/Marketing, vol. 26, Oct. 1965, pp. 53-57, printed. Putnam Publishing Co., 111 East Delaware Place, Chicago, Ill. 60611.

IRRADIATION PRESERVATION:

"Food irradiation," by David M. Varner, article, Food Engineering, vol. 37, Nov. 1965, pp. 53-57, printed. Chilton Co., Chestnut and 56th Sts., Philadelphia, Pa. 19139.

LOBSTERS:

"Easily built trap delivery device completes lobstering automation," article, National Maine Coast Fisherman, vol. 46, Dec. 1965, p. 27, printed. National Maine Coast Fisherman, 22 Main St., Camden, Maine 04843.

MARINE BIOLOGY:

The Scorpionfish Subfamily Setarchinae, Including the Genus Ectreposebastes, by William N. Eschmeyer and Bruce B. Collette, Contribution No. 677, 26 pp., illus., printed. (Reprinted from Bulletin of Marine Science, vol. 16, no. 2, June 1966, pp. 349-375.) Institute of Marine Science, 1 Rickenbacker Causeway, Virginia Key, Miami, Fla. 33219.

MARINE OILS:

"Oxidation of oils in marine products and its prevention," by Kenzo Toyama, article, Chemical Abstracts, vol. 64, Feb. 28, 1966, Abstract No. 7279e, printed. American Chemical Society, 1155 16th St. NW., Washington, D. C. 20006.

MARINE RESEARCH:

Current Status of Marine Research, edited by Robert M. Ingle, Special Scientific Report No. 12, 21 pp., illus., printed, Sept. 1966. Marine Laboratory, Florida State Board of Conservation, Maritime Base, Bayboro Harbor, St. Petersburg, Fla. 33731.

MARINE RESOURCES:

Marine Resources of the Atlantic Coast leaflet series, illus., printed, Oct. 1966. Ernest Mitts, Executive Director, Atlantic States Marine Fisheries Commission, 336 East College Ave., Tallahassee, Fla. 32301:

The American Lobster, Leaflet No. 5, 6 pp.

Summer Flounder--The Middle Atlantic Flatfish, Leaflet No. 6, 4 pp.

American Shad--A Springtime Delicacy, Leaflet No. 7, 4 pp.

Striped Bass, Leaflet No. 8, 4 pp.

MEDITERRANEAN SEA:

Catalogue of Names of Fishes, Molluscs and Crustaceans of Commercial Importance in the Mediterranean, compiled by Giorgio Bini, 422 pp., printed in English, 1965. Single copy 3,000 lira (US\$4.32). Vito Bianco Editore S.p.A., via in Arcione, 71, Rome, Italy. (Published by arrangement with the Food and Agriculture Organization of the United Nations). Contains over 400 illustrations of fish and marine animals with a listing of each specimen's scientific and common names in general use in each Mediterranean country. The aim is to simplify and clarify the designation of commercial fish in the Mediterranean basin.

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These publications are not available from the Fish and Wildlife Service, but usually may be obtained from the organization issuing them.

NORWAY:

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Nutritional Studies with Adult Oysters, CRASSOSTREA VIRGINICA (Gmelin), by Larry Gillespie et al., Technical Series No. 51, 29 pp., illus., printed, Aug. 1966. Florida Board of Conservation, Marine Laboratory, Maritime Base, Bayboro Harbor, St. Petersburg, Fla. 33731.

"Off the bottom oyster culture doubles yields," article, *Fishing Gazette*, vol. 82, June 1965, pp. 78-79, 83, printed. Fishing Gazette Publishing Corp., 461 Eighth Ave., New York, N. Y. 10001.

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"The utilization of phosphorus from animal protein sources for chicks," by P. W. Waldroup, C. B. Ammerman, and R. H. Harms, article, *Poultry Science*, vol. 44, Sept. 1965, pp. 1302-1306, printed. Poultry Science, Texas A. & M. College System, College Station, Tex. 77843.

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"Radiation pasteurization of Gulf Coast oysters," by Arthur F. Novak et al., article, Food Technology, vol. 20, Feb. 1966, pp. 103-104, printed. The Garrard Press, 510 N. Hickory St., Champaign, Ill. 61823.

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The Shrimp Fishery of the Gulf of Mexico (Rio Grande River to Key West), Information Series No. 3, 8 pp., printed, Oct. 1966. Gulf States Marine Fisheries Commission, 312 Audubon Bldg., New Orleans, Louisiana 70112. Contains biological notes and recommendations by Shrimp Biological Research Committee.

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"3,4-benzopyrene content of sausage and smoked fish prepared using fuel gas and coke," by N. D. Gorelova et al., article, Chemical Abstracts, vol. 63, Oct. 11, 1965, Abstract No. 10574e, printed. American Chemical Society, 1155 16th St. NW., Washington, D. C. 20005.

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Air Shipment of Perishables, Seafoods-General, Index No. 7, the Boeing Company Air Cargo Market Development Unit, Commercial Airplane Division, Renton, Wash. This is one in a series on the total perishable market and its adaptability to mass marketing via air transportation.

The study of the perishable section of the air cargo market is designed to show that the domestic and international markets can

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be expanded. The report examines certain key areas of the seafood industry--size, characteristics, markets, and problems--to evaluate their potential. It also evaluates possible profit to airlines if this cargo increases.

The report considers seafood a new air-cargo market that should be penetrated. It is oriented 2 to 5 years ahead--not to present situation.

The report is based on information from persons in the commercial fishing, airline, and container industries. It shows fishery production data from BCF reports.

TUNA:

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"Las migraciones del atun rojo" (The migrations of bluefin tuna), by Sheree Narian Dwivedi, article, Puntal, vol. XIII, no. 146, May 1966, pp. 16-21, illus., printed in Spanish, single issue 20 ptas. (about US\$0.35). Puntal, Apartado de Correos 316, Alicante, Spain.

Report from the Bluefin Tuna Working Group, by J. Hamre, F. Lozano, J. Rodriguez-Roda, and K. Tiews, Statistical News Letters, no. 26, 34 pp., illus., printed, Feb. 1966. International Council for the Exploration of the Sea, Charlottenlund Slot, Denmark. This second report by this working group discusses the development of the bluefin tuna fisheries from 1950-1964 and presents further observations on the size composition of bluefin tuna catches.

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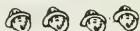
The Oregon Fisheries Commission, Rt. 2, Box 31A, Clackamas, Ore. 97015.

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Fisheries Year Book and Directory 1966-67 (International Reference Book and Directory of the Fishing and Fish Processing Industries), edited by Harry F. Tysser, 467 pp., illus., printed, 1966, £2 (US\$5.60) including postage. British Continental Trade Press Ltd., 222 Strand, London W. C. 2, England. An excellent reference to the world's fishing industries and fish trade. First chapter surveys world's fisheries and industries of major countries. Other chapters discuss progress in selling, freezing, processing, and marketing; fisheries research; preservation of fish; and the fish meal and oil industries. There is an interesting chapter on fish varieties on the market, describing 100 varieties of fish. The reference chapters include fishing vessels built last year and their equipment; fish supply calendar giving type of fish, month, and country of availability; dictionary of fish terms in eight languages; a fish supply calendar; and list of periodicals or journals of interest to the fishing industry. The directory section includes lists of exporters, producers, and trawler owners; importers and wholesalers; fish canners and bottlers, also firms handling machinery and equipment for fish processing and refrigeration; packing machinery and materials; supplies for fisheries (ship builders and repairers, ship chandlers, nets and cordage, instruments, etc.); fish byproducts (meal, oil, vitamins, etc.); cold storage and transport. A list of trade marks and brands, a classified list of advertisers, and a number of pages showing postage stamps with fish designs.

--J. Pileggi



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50 million Americans CAN'T BE WRONG

50 MILLION PEOPLE TURN TO HUNTING AND FISHING FOR RECREATION; THEY, AND ALL AMERICANS, GAIN FROM THE PROGRAM OF

THE BUREAU OF SPORT FISHERIES AND WILDLIFE
FISH AND WILDLIFE SERVICE
U.S. DEPARTMENT OF THE INTERIOR.

NORTHERN WETLANDS ARE VITAL FOR DUCK PRODUCTION ~ SOUTHERN LAKES AND MARSHES ARE NECESSARY FOR WINTER CHARTERS. BOTH ARE USED AS REST AND GOOSE MIGRATION.

WETLANDS ARE PURCHASED AND MAINTAINED WITH FUNDS FROM THE SALE OF "DUCK STAMPS" (ALL DUCK AND GOOSE HUNTERS MUST HAVE ONE.)

MANY OTHER FLUENTS OF WILDLIFE LIVE IN OUR WETLANDS. THEY HAVE MANY GAME AND REPTILES.

WETLANDS ALSO PRODUCE MORE WILDLIFE THAN DEEP FORESTS.

THE BUREAU OF SPORT FISHERIES AND WILDLIFE--- The Federal Agency which helps many of the out-of-doors.

This Bureau conducts research

On.... Fish and fishing waters, to improve fishing on National Forests, National Parks, Indian Reservations, Public Lands, and Military Hospital Areas.

On.... Fish diseases and nutrition, production, and growth; fish problems in large reservoirs; marine game fisheries; and growing fish in rice and farm ponds.

On.... Game bird diseases; ways to make land produce more wildlife; effects of pesticides upon wildlife; methods of protecting crops without excessive loss to wildlife; reforestation-wildlife problems; control of degrading species.

This Bureau also

- Conducts surveys to determine trends in duck and goose populations, as the basis for fixing hunting regulations.
- Enforces Federal Game Laws
- Operates 100 fish hatcheries
- Provides haven for wildlife on the 290 National Wildlife Refuges, composed of 28-1/2 million acres.
- Plans the protection of fish and wildlife resources in large and small watershed development programs, and other Federal water projects.
- Controls predators and rodents
- Protects endangered species, such as the whooping crane.
- Operates a Federal Aid Program, supervising tax money allotted to the States for their fish and game work.
- Cooperates with State fish and game departments in all phases of resource management.

THE CHRONIC EFFECTS OF DDT AND OTHER PESTICIDES ON FISH ARE BEING STUDIED AS A PART OF THE RESEARCH PROGRAM. BY STUDYING FISH SURVIVAL, GROWTH RATES, AND REPRODUCTION ~ SCIENTISTS DISCOVER NEW METHODS OF IMPROVING FISHING.

LOW FLYING PLANE GO CLEAR TO THE ARCTIC ON DUCK SURVEYS

WILD DUCKS AND GEESE ARE COUNTED ON TRANSECT ROUTES; BANNED ON THE NESTING AREAS; AND THEIR POPULATION TRENDS ARE ESTIMATED AGAIN ON THE WINTERING GROUNDS.

NATIONAL HATCHERY FISH ARE STOCKED IN FEDERAL WATERS ~ IN SOME STATE OWNED AREAS ~ AND IN FARM PONDS. FISH REARING METHODS ARE CONSTANTLY BEING IMPROVED, AND THE DETAILS OF BETTER TECHNIQUES ARE PASSED ON TO THE STATES, AND THE PUBLIC.

BUNTING, SCORPIONS, BROWN TOADS, AND OTHER WILDLIFE ON REFUGES

THE CONTINUED DECLINE OF THE CONTINENTAL WATERFOOT, POPULATION AND THE ACCELERATING ENCRUSTATION OF CIVILIZATION ON FISH AND WILDLIFE HABITAT EMPHASIZES THE IMPORTANCE OF THE NATIONAL WILDLIFE REFUGE SYSTEM.

WHOOPING CRANES

I DON'T KNOW WHAT THEY PUT ON THIS GRAIN ~ BUT I CAN'T TOUCH IT

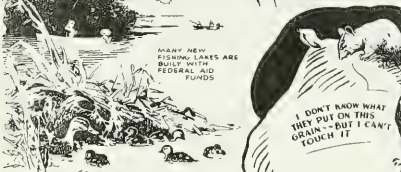
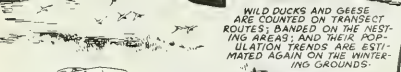
PREDATOR CONTROL REDUCES DEPRECIATIONS AND TRANSMISSION OF DISEASE BY BIRDS AND MAMMALS

WILDLIFE MUST BE HELPED TO ADJUST TO THE NATION'S GROWTH. ON NATIONAL WILDLIFE REFUGES, AND ON FEDERAL AND STATE RESEARCH AREAS, AMERICA IS LEARNING HOW TO GROW MORE GAME ON LESS GROUND.

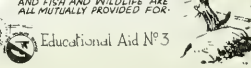
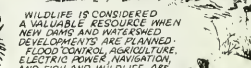
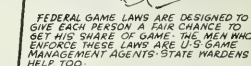
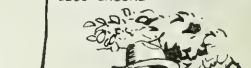
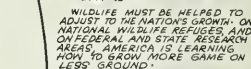
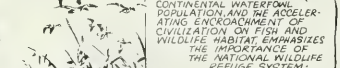
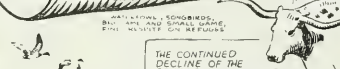
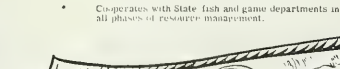
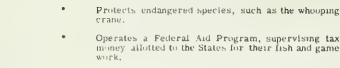
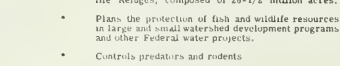
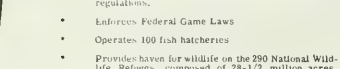
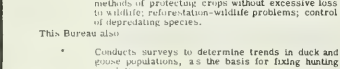
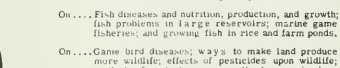
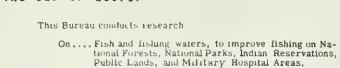
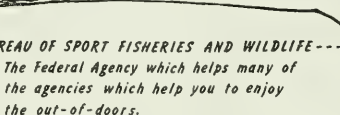
FEDERAL GAME LAWS ARE DESIGNED TO GIVE EACH PERSON A FAIR CHANCE TO GET HIS SHARE OF GAME. THE MEN WHO ENFORCE THESE LAWS ARE U.S. GAME MANAGEMENT AGENTS. STATE WARDENS HELP, TOO.

WILDLIFE IS CONSIDERED A VALUABLE RESOURCE WHEN NEW DAMS AND WATERWHEEL DEVELOPMENTS ARE PLANNED. FLOOD CONTROL, AGRICULTURE, ELECTRIC POWER, NAVIGATION, AND FISH AND WILDLIFE ARE ALL MUTUALLY PROVIDED FOR.

Educational Aid No. 3



MONEY FROM TAKES ON SPORTING ARMS AND AMMUNITION, AND ON FISHING TACKLE, IS DIVIDED AMONG THE STATE CONSERVATION AGENCIES. THEY ADD 75% TO EVERY 75% THE U.S. ALLIOTS AND USE IT ON LAND ACQUISITION, MAINTENANCE, AND RESEARCH.





UNITED STATES DEPARTMENT OF THE INTERIOR
STEWART L. UDALL, SECRETARY

STANLEY A. CAIN, ASSISTANT SECRETARY,
FISH AND WILDLIFE AND PARKS

CLARENCE F. PAUTZKE, COMMISSIONER,
FISH AND WILDLIFE SERVICE

HAROLD E. CROWTHER, ACTING DIRECTOR
BUREAU OF COMMERCIAL FISHERIES

start it *RIGHT*



WITH FISHERY PRODUCT
STANDARDS
AND **INSPECTION**

COMMERCIAL FISHERIES *Review*

SH VOL. 29, NO. 2

FEBRUARY 1967

11
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Fishes



COVER: This African boy was so hungry that he could not wait for the flour to be baked. The flour was provided by the UN's Food and Agriculture Organization.

For him--and for hundreds of millions of other children around the world who go to bed hungry every night--fish protein concentrate may ensure a better tomorrow.

(Photo: FAO)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.



FISHERMEN'S MEMORIAL--CLOWICESTER, MASS.

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The Bureau of Sport Fisheries and Wildlife
make up The Fish and Wildlife Service of
The United States Department of the Interior.

Throughout this book, the initials BCF stand
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A Japanese fisherman and his family at evening meal. His favorite dish is "Sashimi," pieces of raw fish dipped in soy sauce. His forebears for hundred of years were fishermen. (WHO Photo: T. Takahara)

INTERIOR WILL STEP UP FISH PROTEIN CONCENTRATE PROGRAM

The Department of the Interior will accelerate its fish protein concentrate (FPC) program. The order "go" will be given shortly after the end of a 30-day waiting period set by the Food and Drug Administration (FDA).

On February 2, 1967, FDA published in the "Federal Register" proposed regulations governing the sale of FPC as a food additive in interstate commerce. The 30-day period offers the public an opportunity to make valid objections.

FPC was made from whole Atlantic red hake, a codlike fish, by scientists of the Bureau of Commercial Fisheries. It looks like a light-tan flour and is virtually odorless and tasteless. It is over 80 percent animal protein and also has several nutritional minerals. The nutritive value of 2 ounces of FPC, costing about 3 cents, almost equals that of a 12-ounce steak costing nearly \$1. About 6 pounds of fish are needed to produce 1 pound of FPC.

Experts concerned with the world's population explosion and the desperate need to find new food sources believe FPC can become a lifeline to a better future for hungry millions everywhere.

About 2 billion of the 3 billion people on earth, including 50-70 percent of preschool children, suffer from protein malnutrition. This type of malnutrition can produce mental retardation in children; even ordinary childhood diseases may be fatal to them. And by the year 2000, the 3 billion people will be about 7 billion.

Secretary of the Interior Stewart L. Udall said that the FDA action means "that now for as little as a half-cent a day, an undernourished person, wherever he lives, can be assured of sufficient life-sustaining animal protein. World food and health organizations have pointed to protein hunger as the most desperate human problem of the century. We now have proved that fish protein concentrate, one very effective answer to protein malnutrition, can be produced in laboratory-size batches. Our next step is large-scale production demonstration in pilot plants."

The Department of the Interior is authorized to build one demonstration plant and to lease

another. A November 1966 law (PL 89-701) authorizes appropriations of \$1 million to build one plant--and \$1,555,000 annually for 5 years beginning July 1, 1967, to lease another plant, operate both the constructed and leased plants, and to conduct necessary research.

BCF scientists worked 3 years to develop the present process for making FPC. One breakthrough was the discovery that isopropyl alcohol would satisfactorily extract oil and water from the fish. This was an indispensable step toward making a stable and palatable product from an inexpensive fish.

On December 1, 1965, the National Academy of Sciences advised Secretary Udall that "fish protein concentrate, from whole hake, as prepared by the Bureau's process, is safe, nutritious, wholesome, and fit for human consumption."

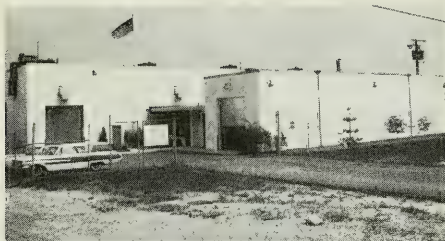
The scientists at BCF's model-scale plant in Beltsville, Md., near Washington, D. C., found that the solvent-extracted FPC blends well with other foods. It was tested successfully as an ingredient in beverages, soups, noodles, gravy, bread, and cookies; adding FPC increases their nutritive value appreciably.

The hake used to make FPC were obtained from commercial fishermen in New England, immediately packed in ice, and shipped in a refrigerated truck to Beltsville. Hake are plentiful in the Atlantic and Pacific. Other species of fish also can be used.

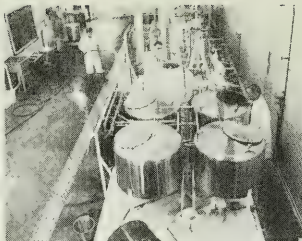
BCF specialists have estimated that the United States can easily harvest about 12 billion pounds of fish each year from U. S. waters--about $2\frac{1}{2}$ times the present catch. If only the fish that are not harvested now were made into FPC, they would provide the additional high-quality animal protein needed to balance the diet of 300 million people for a year at a cost of less than a half-cent per person per day.

When the ocean's underutilized resources are used to make FPC, the U. S. fishing, shipbuilding, and auxiliary industries also will gain.





FPC is made here--in Beltsville, Md., near Washington, D. C. This is a pilot plant designed to evaluate equipment, processing methods, and to provide engineering samples.

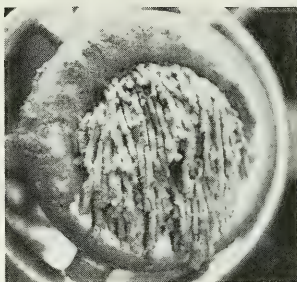


Overall view of lab from end of the processing line. L to R: Engineering Technician Al Novinski, Chemical Engineers Herb Brecker and Bob Ernst.

HOW FPC IS MADE



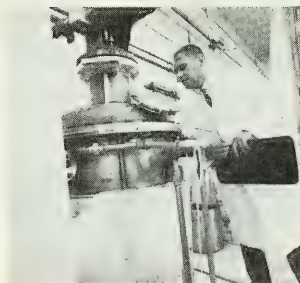
GRINDING FISH: Operator Tom Brown drops hake into grinder, which produces



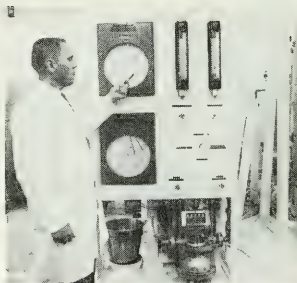
. a FISHBURGER



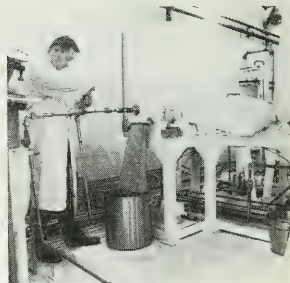
Fishburger is mixed with alcohol in unheated vessel to remove water and fats (they dissolve in alcohol).



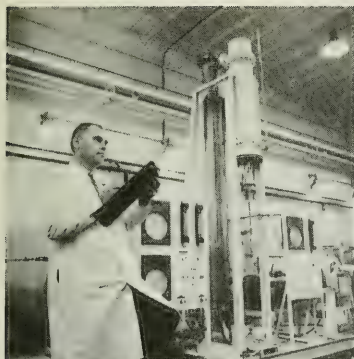
HOT ALCOHOL is used to continue the extraction of fats and moisture from the fish.



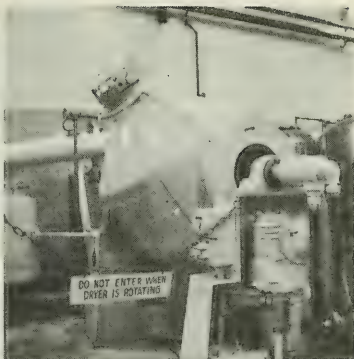
Processing of fish is conducted under carefully controlled conditions of time, temperature, and the completeness of each operation.



SEPARATION of solids, which drop into container, from liquids.



DISTILLATION COLUMN recovers alcohol, which is used again.



ROTATING VACUUM DRYER removes virtually all traces of the solvent (alcohol).



FPC



FINE GRINDER reduces fully dried FPC to particle size desired. It is bagged and marked to indicate the different experimental conditions under which it was produced.



All these foods contain FPC.

BCF HEAD REPORTS STRIKING TECHNOLOGIC GAINS IN 1966

Crowther Also Tells Cannery Convention
Interest in the Sea's Resources is Growing Rapidly

For several segments of the fishing industry, "1966 was a banner year," but overall the industry set few records, reported Harold E. Crowther, Acting Director, Bureau of Commercial Fisheries (BCF) to the National Cannery Convention in Chicago on January 23.

But in two areas there were significant advances that portend even greater progress for the years ahead: technologic achievements by BCF scientists to aid the industry--and rapidly growing interest by Government and the public in the sea and its riches.



Harold E. Crowther.

Director Crowther said: "There is no doubt in my mind that events of last year clearly indicate that we are entering a new era of ocean science and the use of the ocean's resources."

These were the 1966 highlights presented by Director Crowther (the quotes are his):

Statistics on the Industry

- Per-capita consumption of edible products declined from 11 pounds in 1965 to 10.6.

However, per-capita supply of all products--edible and industrial--on a round-weight basis was 64 pounds, a recovery of the 9 pounds lost in 1965. The gain was attributed mainly to increased use of fish meal for poultry and livestock feed.

- Imports were up 100 million pounds over 1965, primarily fish meal and frozen blocks.

- Exports, only a small part of U.S. foreign trade, reached \$100 million, up slightly from 1965 and nearly double the value of \$48 million in 1960.

Legislation

- One of the most important developments was passage of the Marine Resources and Development Act of 1966, which provided for 2 high-level groups to carry out its purposes. "This Act is a significant milestone in establishing the importance of ocean resources and should help coordinate the efforts of 22 different agencies conducting oceanographic research. . . . We now have an instrument (the 2 groups) to define effectively a national ocean policy, to specify objectives and goals of a national oceanographic program, and to recommend how our country can best achieve these goals."

Effective Use of the Sea

- In July 1966, the survey vessel "Oceanographer" of the U. S. Coast and Geodetic Survey was commissioned.

- President Johnson released the report of his Science Advisory Committee, "Use of the Sea." The report is of special interest to those in industry, fishery research, and administration "because it places emphasis on development and use of natural resources of the oceans. This is especially meaningful for the Bureau's fish protein concentrate program."

To implement the PSAC report, Secretary Udall named a top-level Interior team headed by Assistant Secretary Stanley A. Cain to "develop and coordinate Interior's many programs for developing and utilizing resources of the sea."

- The concentration of scientific, technical, legal, and engineering talent at the Second Annual Marine Technology Conference in Washington last summer showed the widespread interest in developing ocean resources.

Financial and Other Aid Programs

- There was a substantial increase in BCF's 3 financial assistance programs--vessel construction subsidy, mortgage insurance, and fisheries loan fund. But by year's end, the programs were forced to mark time until new funds were made available. "Many in industry and Government believe these 3 programs are as important as any in the Bureau and are essential to development of a modern fishing industry."

- Federal Aid. 1966 was the first full year under the Commercial Fisheries Research and Development Act, Public Law 88-309. The appropriation acts in both fiscal 1966 and 1967 made \$4.1 million available to the States on a matching basis. The States responded well. "Many excellent research and development projects are now underway. PL 88-309 funds also are helping to upgrade many State fishery programs "through construction of laboratory facilities, research vessels, and employment of additional qualified personnel."

- Agency for International Development. BCF cooperated in AID's program of exporting low-cost fishery items to the Congo. In the past 8 months, AID made available \$1.1 million to buy canned fishery products.

Technologic Advances

BCF made progress in testing new harvesting and preservation methods:

- Two irradiators are being used on BCF vessels "Delaware" and "Oregon" in the Northwest Atlantic and Gulf of Mexico to test this method of pasteurization at sea. Haddock, shrimp, and clams have been irradiated and now are being tested in the laboratory for odor and taste qualities. This method might permit a vessel to remain at sea twice as long and still deliver high-quality fresh fish.

- BCF scientists at the Ketchikan (Alaska) Technology Laboratory developed a method that greatly facilitates shrimp peeling with present machines.

- In the Great Lakes, where alewife fishery development is emphasized, "a project aimed at developing an electric system to guide and harvest fish is well underway."

- During the past 2 years, BCF exploratory fishing and gear development scientists have developed an electro-shrimp trawling system that is as effective during daylight hours as standard gear is during darkness (when shrimp normally are available).

- In the Pacific Northwest, Seattle-based BCF scientists developed a system featuring a large midwater trawl that stimulated the appearance of a new U. S. fishery for Pacific hake.

- Sonar. Significant progress was made in developing "a long-range, high-definition sonar for locating schools of fish and as a research tool for inventory of fishery resources."

- Space Oceanography. BCF scientists are working with the Naval Oceanographic Office and NASA "to evaluate the use of spacecraft and satellites for gathering oceanographic data." In 1966, during the last Gemini flight, the BCF research vessel "Geronimo" carried out observations in the Gulf of Mexico.

- Artificial Rearing of Mackerel and Sardines. "One of the most important scientific breakthroughs was the first successful rearing in the laboratory of Pacific mackerel and Pacific sardines from the egg to an advanced juvenile stage."

- Sea Lamprey Control. "Excellent progress continues to be made in control of the predatory sea lamprey of the Great Lakes by using chemical lampricides." In 1966, BCF biologists reported the lamprey population down 91 percent from the previous 5-year average.

- Salmon. The 4-million-case Alaskan salmon pack was the largest since 1949 and the escapement was good. "Salmon appear to be responding well to improved management practices."

Office of International Trade Promotion

BCF organized this office in 1965 to promote and demonstrate quality U. S. fishery products abroad. The office participated in

two international food trade shows in 1965 and 6 in 1966. "A conservative estimate of total sales made during the 8 fairs is in excess of \$800,000."

Codex Alimentarius

The U. S. worked with 14 countries toward the development of international trading standards for fishery products through the Joint FAO/WHO Codex Alimentarius Commission.

End of Meatless Fridays

BCF is studying the effects of the end of meatless Fridays for Roman Catholics on the U. S. fishing industry.

The National Canners Convention also heard talks on legislation, the international situation, and Interior Department's responsibilities to the fishing industry from Senator Warren G. Magnuson (D., Wash.), Deputy Assistant Secretary for Fish and Wildlife and Parks, Clarence Pautzke, and Ambassador Donald L. McKernan.



Created in 1849, the Department of the Interior—America's Department of Natural Resources—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.

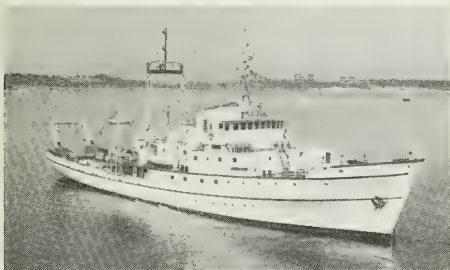


UNITED STATES

Forecast Fewer Groundfish and Scallop on New England Banks

Various species of groundfish and sea scallops fished by New England fishermen will generally be less abundant in 1967, forecasts BCF's North Atlantic Region. The forecast is based on information provided by biologists of BCF's Woods Hole Laboratory who monitor landings of commercial fishermen and use the research vessel "Albatross IV" to study, by sampling, the populations of fish and shellfish on offshore banks.

Haddock landings in New England in 1966 were about 118 million pounds, compared with 117 million pounds in 1965. The 1966 catch was high despite fewer fish on Georges Bank. The decrease was due to natural causes and heavy foreign fishing in 1965.



The Albatross IV, research vessel of BCF. (Photo: Robert K. Brigham.)

The haddock stock there now is in a serious condition since it consists mainly of a single year class of fish--the one spawned in 1963. Albatross IV surveys showed that the 1966 year class was a poor one, as were 1965 and 1964. About 60% of U. S. landings of Georges Bank haddock in 1966 were from the 1963 year class--in the scrod-size category.

In 1967, these will grow into the large-size haddock category. The abundance of scrod haddock will decrease in 1967 and following years. Total abundance of both size categories will decrease in 1967 and probably continue to decrease through 1968 and 1969.

The haddock picture is much brighter on Browns Bank. There, the large 1962 and 1963 year classes will just be coming into the fishery in 1967, so abundance is expected to increase somewhat in 1967 and substantially in 1968.

Cod Landings Steady, Whiting Up

Cod landings in 1966 were 29 million pounds, about the same as in 1965, although there was a slight decrease in abundance. The decrease is expected to continue through 1967.

Food fish landings of whiting (silver hake) from the Gulf of Maine increased from 74 million pounds in 1965 to an estimated 81 million in 1966, due to increased fishing effort. Abundance held steady and is not expected to change in 1967.

In southern New England, where whiting are taken primarily for industrial purposes, a decrease in abundance on the inshore grounds occurred in 1966--landings dropping from 1965's 23 million pounds to 7 million pounds. This stock was heavily fished by the Soviets in 1965 and 1966. It is expected that the United States fleet in this area will continue to have difficulty finding large commercial quantities in 1967.

Ocean perch (redfish) landings decreased from 83 million pounds in 1965 to 81 million pounds in 1966. Abundance increased in the Gulf of Maine and held steady on Nova Scotian and Gulf of St. Lawrence grounds. Abundance levels are expected to continue through 1967.

Yellowtail flounder abundance has been declining recently, due to low recruitment of year classes. This is reflected in the landings: they dropped from 75 million pounds in 1965 to 65 million pounds in 1966. The decline is expected to continue through 1967.

Red Hake Abundance Dropped Sharply

Red hake is taken by the southern New England fishery for industrial purposes and by the Soviets for food. Abundance dropped sharply in 1966, probably as a result of heavy

Soviet exploitation in 1965 and early 1966. U. S. landings in 1966 were only 10 million pounds, compared with 63 million pounds in 1965. If red hake are again heavily fished by the USSR, U. S. fishermen can expect continued low abundance on their traditional grounds.

Sea scallops again were landed from both Georges Bank and Middle Atlantic grounds in 1966. Landings from Georges Bank were about 2 million pounds of meats in 1966, compared with 3 million pounds in 1965, and abundance is expected to remain about the same in 1967.

The Middle Atlantic grounds provided about 11 million pounds in 1966, about the same as in 1965. Analysis of catches shows no backlog of older scallops, so abundance in 1967 will depend largely upon the size of the newly recruited year class.

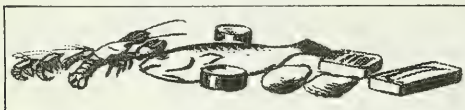


Marketing

OUTLOOK FOR EDIBLE FISHERY PRODUCTS IN 1967 AND REVIEW OF 1966

As 1967 began, supplies of edible fishery products were heavier than a year earlier. Frozen stocks of ocean perch and cod fillets, dressed whiting, fish sticks and portions, halibut, and lobster tails were relatively abundant.

In the category of canned products, salmon was plentiful. Scallops and crabs (including crab meat) were among the few popular frozen items with lower stocks than at the beginning of 1966. All in all, supplies should be ample to meet the usual upsurge in demand during the coming Lenten season.



The per-capita consumption of fishery products dipped to 10.6 pounds (edible weight) in 1966, down 0.4 pound from the 11 of 1965, but about the same as in 1962-1964. Consumption of fresh and frozen fishery products gained in 1966--at an estimated 6.2 pounds per person, it was the highest since the early 1950s. All of the decline was in

canned fishery products, which dropped from 4.4 pounds in 1965 to 3.9 pounds in 1966. Consumption of cured products held at 0.5 pound per person.

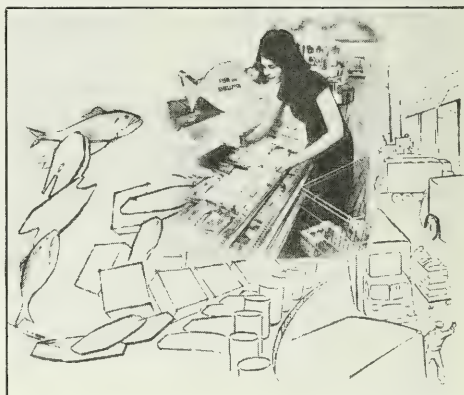
There was no single factor responsible for the decline in per-capita consumption during 1966. The higher prices accompanying lower availability of canned tuna and pink salmon early in 1966 probably contributed to the decline. The effect of the change in fasting requirements of the Roman Catholic Church is under study. (Branch of Current Economic Analysis, BCF.)



December 1966 Wholesale Prices and Indexes for Edibles

Wholesale prices for edible fishery products (fresh, frozen, and canned) were up slightly in December 1966. At 125.3 percent of the 1957-59 average, the index rose 0.2 percent from November to December. This was principally because of higher prices for most items in the drawn, dressed, or whole finfish subgroup. Price increases for other items, including fresh shrimp and canned tuna, were offset by lower prices for several other products. Compared with December 1965, the overall index in December 1966 was up 5 percent because of higher prices generally for most items.

Seasonally higher prices in December 1966 for most items in the drawn, dressed, or whole



Wholesale Average Prices and Indexes for Edible Fish and Shellfish, December 1966 with Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices 1/ (\$)		Indexes (1967-69=100)			
			Dec. 1966	Nov. 1966	Dec. 1966	Nov. 1966	Oct. 1966	Dec. 1966
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					126.3	125.0	131.3	119.3
Fresh & Frozen Fishery Products					126.7	126.6	136.1	126.6
Drawn, Dressed, or Whole Fish					123.7	121.0	138.2	123.4
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.15	.15	117.1	115.2	164.0	119.5
Halibut, wester., 20/30 lbs., drsd., fresh or froz.	New York	lb.	.48	.48	142.0	142.0	139.0	141.0
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.88	.86	122.2	120.2	129.6	122.3
Whitefish, L. Superior, drawn, fresh	Chicago	lb.	.71	.63	105.2	93.3	91.8	96.3
Yellow pike L., Michigan & Huron, rnd., fresh	New York	lb.	.69	.65	112.9	108.4	108.9	116.2
Processed, Fresh (Fish and Shellfish)					125.7	127.8	138.1	123.5
Fillet, haddock, smd., skins on, 20-lb. tins	Boston	lb.	.40	.47	97.2	114.2	131.2	108.7
Shrimp, lge. (26-30 count, headless, fresh)	New York	lb.	1.07	1.03	125.4	120.1	131.2	108.6
Oysters, shucked, standards	Norfolk	gal.	7.75	8.25	130.7	139.1	147.5	147.8
Processed, Frozen (Fish & Shellfish)					124.9	125.1	128.6	110.8
Fillet, flounder, skidless, 1-lb. pkg.	Boston	lb.	.46	.44	114.0	110.2	109.0	101.4
Haddock, smd., skins on, 1-lb. pkg.	Boston	lb.	.39	.40	114.3	117.3	116.8	115.8
Ocean perch, lge., skins on 1-lb. pkg.	Boston	lb.	.31	.30	108.7	103.5	110.5	112.2
Shrimp, lge. (26-30 count), brown, 5-lb. pkg.	Chicago	lb.	1.11	1.11	131.0	131.0	137.5	107.9
Canned Fishery Products					123.4	122.9	123.3	117.5
Salmon, pink, No. 1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	27.00	27.50	119.9	119.9	122.0	119.8
Tuna, lt. meat, chunk, No. 1 1/2 tuna (6-1 1/2 oz.), 48 cans/cs.	Los Angeles	cs.	13.08	12.95	116.1	115.0	115.0	103.8
Mackerel, jack, Calif., No. 1 tall (15 oz.), 48 cans/cs.	Los Angeles	cs.	8.50	8.50	144.1	144.1	135.6	120.9
Sardines, Maine, keyless oil, 1/4 drawn (3-3/4 oz.), 100 cans/cs.	New York	cs.	11.25	11.25	144.3	144.3	144.3	131.5

1/Represent average prices for one day (Monday or Tuesday) during week in which 15th of month occurs. Prices are published as indicators of movement, not necessarily absolute level. See daily Market News Service "Fishery Products Reports" for actual prices.

Source: U. S. Department of Labor, Bureau of Labor Statistics.

finfish subgroup resulted in a 2.2-percent increase from November. Wholesale prices at Chicago rose sharply for Lake Superior fresh whitefish (up 12.8 percent) because of very light supplies. At New York City, prices were up 6.1 percent for Great Lakes round yellow pike, rose 1.7 percent for frozen king salmon, but they remained unchanged for frozen western halibut. Prices for exvessel large haddock at Boston (up 1.6 percent) were higher from November to December. Compared with December 1965, the subgroup index in December 1966 was up 0.2 percent--prices were higher for whitefish (up 12.8 percent) and halibut (up 0.7 percent) but were partly offset by slightly lower prices for other items.

Shellfish Are Mixed Picture

Although December 1966 prices for South Atlantic fresh shrimp at New York City rose 4.4 percent from November, they were offset by a sharp price drop at Boston for fresh haddock fillets (down 14.9 percent). Prices also dropped for standard shucked oysters (down 6 percent) at Norfolk. These lower

prices brought the processed fresh fish and shellfish subgroup index down 1.5 percent from November. Compared with December 1965, the subgroup index in December 1966 was up 1.8 percent, mainly because shrimp prices were higher (up 17.6 percent) and cancelled out lower prices for shucked oysters (down 11.4 percent) and haddock fillets (down 8 percent).

The December 1966 subgroup index for processed frozen fish and shellfish was down 0.2 percent from November. Although prices at Boston for frozen ocean perch fillets rose 5 percent and flounder fillets 3.4 percent, prices for small haddock fillets were down 2.6 percent. Frozen shrimp prices at Chicago remained unchanged from November. Compared with December 1965, the December 1966 subgroup index was 12.9 percent higher because of substantially higher shrimp prices (up 21.4 percent). Prices for flounder fillets (up 12.4 percent) were higher than a year earlier, but they were lower for ocean perch (down 3.1 percent) and haddock fillets (down 1.3 percent).

Higher prices from November to December for canned tuna (up 1 percent) were solely responsible for a 0.4 percent rise in the subgroup index for canned fishery products. Prices were unchanged for other canned fish items. Compared with December 1965, the subgroup index for December 1966 was up 5 percent. Prices were higher for all items--more substantially so for California jack mackerel (up 19.2 percent) and canned Maine sardines (up 9.7 percent). (BCF Market News Service.)



1966 Shrimp Imports Rose 8.7%

U. S. imports of shrimp (fresh, frozen, canned, and dried) for January-November 1966 were 160.8 million pounds--an increase of 8.7 percent from the 1965 period's 147.9 million. Imports from Mexico for the 1966 period were about 60.8 million pounds--up 12.9 percent from 1965's 53.8 million pounds.

The U. S. imported 20.4 million pounds of shrimp (fresh, frozen, canned, and dried) in November 1966; in November 1965, 18.5 million pounds. Imports during November 1966 of fresh or frozen heads-off shrimp (shells-on) were 15.9 million pounds; peeled and deveined, 3 million pounds; frozen breaded (raw or cooked), 82,572 pounds; and other types¹ of shrimp products (some dried and canned) about 1.3 million pounds.

Mexico shipped about 10.5 million pounds; about 8.9 million pounds of fresh or frozen heads-off shrimp (shells-on); peeled and deveined, 1.3 million pounds; frozen breaded (raw or cooked) 82,084 pounds; other types, 169,596 pounds. In November 1965, Mexico shipped 9.6 million pounds.

¹/Imports of "other types" of shrimp: peeled in airtight containers or canned (233,456 pounds); cooked but not breaded (173,870 pounds); dried (58,801 pounds); others not specified (838,513 pounds).



Salmon

DECEMBER 1966 PACIFIC CANNED STOCKS HIGHER THAN 1965

On December 1, 1966, canners' stocks (sold and unsold) in the U. S. of Pacific canned salmon totaled 3,294,606 standard cases

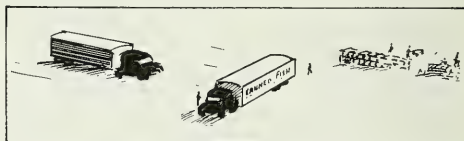
(48 1-lb. cans)--816,548 cases above the 2,478,058 of December 1, 1965.

Of total stocks of 4,340,853 actual cases (cans of $\frac{1}{4}$ -lb., $\frac{1}{2}$ -lb., 1-lb., etc.)--red accounted for 2,117,218 cases (911,258 cases were 1-lb. cans and 798,015 cases were $\frac{1}{2}$ -lb. cans) or 48.8 percent of the total canners' stocks on December 1, 1966; pink--1,562,139 cases or 36 percent (1,180,122 cases were 1-lb. talls; chum--316,899 cases, mostly 1-lb. talls; coho or silver--227,441 cases; and king--117,156 cases.

Total Canners' Stocks of Pacific Canned Salmon, Dec. 1, 1966			
Species	Dec. 1, 1966	Nov. 1, 1966	Dec. 1, 1965
.(No. of Actual Cases)			
King . . .	117,156	119,188	123,126
Red . . .	2,117,218	2,246,350	1,902,932
Coho . . .	227,441	259,476	193,729
Pink . . .	1,562,139	1,655,427	767,120
Chum . .	316,899	369,069	305,471
Total	4,340,853	4,649,510	3,292,378

5 Million Cases for 1966/67 Market

Carryover stocks at the canners' level totaled 743,166 standard cases on July 1, 1966, the approximate opening of the Pacific salmon packing season. Adding the 1966 new season pack of 4,344,732 standard cases (preliminary data) the total available supply for the 1966/67 market season was 5,087,898 standard cases.



Shipments at canners' level of all salmon species, July 1 to December 1, 1966, totaled 1,793,292 standard cases. The carryover of 743,166 standard cases on July 1, 1966, the beginning of the 1966/67 sales year, was 1.3 percent higher than the carryover of 733,575 cases a year earlier.

Final data on the 1966 U. S. pack of Pacific canned salmon (including Alaska) show 4,344,732 standard cases--22.7 percent above 1965's of 3,541,187 cases. By species, the new pack was made up (1965 pack in parentheses): king, 81,626 standard cases (95,503); red, 1,441,930 cases (2,013,077); coho, 196,017 cases (170,064); pink, 2,044,479 cases (951,688); chum, 580,680 cases (310,855).

Data on canned salmon stocks are based on reports from U. S. Pacific Coast cannery who handled over 96 percent of the 1966 salmon pack. (Division of Statistics and Economics, National Cannery Association, Jan. 5, 1967.)



Defense Bought More Fishery Products in October-November 1966

The Department of Defense (DOD), a major buyer of fresh and frozen fishery products, bought 2.9 million pounds in November 1966, worth about \$2.3 million.

In November 1966, DOD purchases rose 10.3 percent in quantity and 3 percent in value. The increase was due mainly to larger purchases of oysters, fish fillets, haddock portions, and salmon steaks.

Compared with November 1965, November 1966 purchases were up 13.4 percent in quantity and 16.2 percent in value. Average prices were generally higher in November 1966 than in 1965.



Cans Shipments for Fishery Products Steady



During January-October 1966, 2,580,702 base boxes of steel and aluminum were used to make cans shipped to fish and shellfish canning plants. During the same period in 1965, 2,539,115 base boxes were used.

Note: Statistics Cover all commercial and captive plants known to be producing metal cans. A "base box" is an area of 31,360 square inches, equivalent to 112 sheets 14" x 20" size. Tonnage figures for steel (tinplate) cans are derived by use of the factor 23.7 base boxes per short ton of steel.

Source: U. S. Department of Commerce, Bureau of the Census.

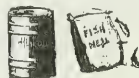


Fish Meal Supply Rose 20%, Solubles Dropped 13%

Based on domestic production and imports, the supply of fish meal available in the U. S. during the first 11 months of 1966 was 603,034 short tons--99,628 tons (or 19.8 percent) more than the 1965 period. Domestic production was 46,555 tons (20 percent) lower, but imports were 157,334 tons (60.6 percent) higher than in January-November 1965. Peru lead with shipments of 259,051 tons.

U. S. Supply of Fish Meal and Solubles, January-November 1966			
Item	Jan.-Nov.		Total
	1966	1965	1965
. . . (Short Tons) . . .			
Fish Meal and Scrap:			
Domestic production:			
Groundfish	9,877	10,179	10,696
Herring	10,984	12,688	12,932
Menhaden 1/	128,842	169,871	175,959
Tuna and mackerel	28,259	23,124	25,399
Unclassified	8,047	16,702	17,360
Total production 2/	186,009	232,564	242,346
Imports:			
Canada	41,132	40,046	43,830
Peru	259,051	206,006	209,801
Chile	80,623	5,201	5,651
Norway	21,048	78	78
So. Africa Rep.	6,600	3,600	5,100
Other countries	8,571	4,760	6,206
Total imports	417,025	259,681	270,666
Available fish meal supply	603,034	503,406	524,717
Fish Solubles 3/:			
Domestic production	80,738	92,290	94,839
Imports:			
Canada	1,352	1,373	1,488
Peru	1,941	2,598	2,598
Mexico	385	227	227
Other countries	470	825	825
Total imports	4,148	5,023	5,138
Available fish solubles supply	84,886	97,313	99,977

The U. S. supply of fish solubles was 84,886 tons--down 12.8 percent from the 1965 period. Domestic production decreased 12.5 percent, imports decreased 17.4 percent.



Over 100 Fishery Cooperatives

There are more than 100 fishery cooperatives in the United States with 10,124 members. The members owned and operated 7,514 commercial fishing boats or vessels. Over 60 percent of the cooperatives are on the Pacific Coast, and the rest are scattered. Most cooperatives do the marketing and buying for their members.



Oceanography

GULF COAST SALT DOMES MAY HAVE OTHER USES

Information on the 329 proved salt domes in the Gulf of Mexico area appears in the free Bureau of Mines publication, "Salt Domes in Texas, Louisiana, Mississippi, Alabama, and Offshore Tidelands: a Survey," Information Circular 8313. The Gulf area contains nearly all of these geological phenomena in the U. S., except for small sections of southern Utah and Colorado. The domes are important sources of rock salt, and many domes have petroleum and sulfur deposits combined with them.

Salt domes can be shaped to whatever size is desired--by dissolving salt from the formation--for inexpensive storage of natural gas. The cost of doing this is estimated at about one percent of installing steel tanks above ground.

Of the 329, four are in the Gulf off Texas and 67 off Louisiana. From 1937-1964, Louisiana domes produced 379,481,700 barrels of petroleum and condensate; one at Grand Isle also produced 1,973,000 tons of sulfur.

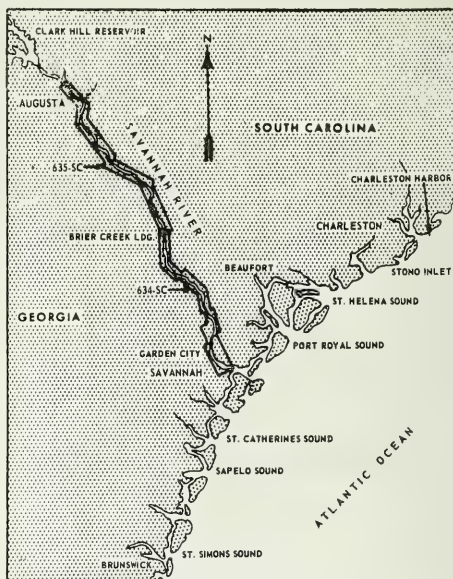
PLAN FOR PLANNED ATLANTIC SHELF SEDIMENT DATA BANK

National interest in developing the U. S. Continental Shelf for resources has prompted the Naval Oceanographic Data Center to set up an Atlantic Shelf sediment data bank. About 250 groups representing Government academic institutions and industry were asked about their holdings of data or sediment samples and their willingness to con-

tribute data to the project. Forty percent answered.

FIRST NAUTICAL CHARTS FOR SAVANNAH RIVER CHANNEL AVAILABLE

The Coast and Geodetic Survey has prepared the first nautical charts for the 180-mile-long, 9-foot Savannah River channel from Savannah to Augusta, Ga. The charts, identified as 634-SC and 635-SC, are folded small-craft charts, similar to those for the Atlantic Coast Intracoastal Waterway. They were designed for the small cockpits of pleasure craft and provide special information for them.



Savannah River, Georgia area (Savannah to Augusta) covered by new small-craft charts.

The charts are based on 1964 aerial photography by the Coast and Geodetic Survey and show the latest channel information available from the Army Corps of Engineers. Augusta is one of Georgia's 5 major ports and the improved Savannah River is an important link in the State's waterway system.

New editions of Chart 634-SC will be published annually and of 635-SC every 2 years. They can be kept timely between editions by adding corrections published in local or week-

ly notices to mariners. They may be bought for \$1 each from nautical charts agents or from the Coast and Geodetic Survey, Washington Science Center, Rockville, Md. 20852.



SEAFOODS SAY -- POUNDS AWAY

From the quiet charm of Maryland's Eastern Shore and from the exotic Middle East come two unusual seafood dishes designed to delight the dieter.

Satisfying nourishment is the keynote in Chef's Salad Chesapeake with Lemon-Caper Dressing. Asparagus spears, nested in lettuce cups, are topped with crab meat, hard-cooked egg, and a perky, low calorie dressing to win the compliments of the weight watchers and the accolades of the hearty eaters.

CHEF'S SALAD CHESAPEAKE

- | | |
|--|---|
| 1 can (12 ounces) blue crab meat
or other crab meat, fresh,
frozen, or pasteurized
or | 1 package (10 ounces)
frozen asparagus spears |
| 2 cans (6-1/2 or 7-1/2 ounces
each) crab meat | 6 lettuce cups
Lemon-Caper Dressing
3 hard-cooked eggs, sliced
Paprika |

Thaw frozen crab meat. Drain crab meat. Remove any remaining shell or cartilage. Flake the crab meat. Cook asparagus spears according to directions on package. Drain and chill. Place 3 asparagus spears in each lettuce cup. Place about $\frac{1}{2}$ cup crab meat on asparagus. Cover with approximately 2 tablespoons Lemon-Caper Dressing. Top with 3 slices hard-cooked egg. Sprinkle with paprika. Serves 6. Approximately 130 calories in each serving.

LEMON-CAPER DRESSING

- | | |
|---|-----------------------------------|
| 1/2 cup low calorie salad dressing
(mayonnaise type) | 1/2 teaspoon Worcestershire sauce |
| 1 tablespoon drained capers | 2 drops liquid hot pepper sauce |
| 1 tablespoon lemon juice | |
| 1/2 teaspoon prepared mustard | |

Combine all ingredients. Chill. Makes approximately $\frac{2}{3}$ cup salad dressing.

Cod Curry is an easy exotic, as meaty cod fillets blend with a colorful combination of readily available kitchen staples. The subtle hint of curry excites taste buds in this high protein entree while vegetables and skim milk add only a few calories to the showy sauce.

COD CURRY

- | | |
|--|------------------------------|
| 2 pounds cod fillets or other fish
fillets, fresh or frozen | 1 teaspoon curry powder |
| 1 cup thinly sliced celery | 1 teaspoon salt |
| 1 cup thinly sliced onion | Dash pepper |
| 1 tablespoon melted fat or oil | 3/4 cup skim milk
Paprika |

Meals with minimal calories, maximum flavor, and eye-appeal aren't the easiest thing in the world to come by. However, even company dinners that meet these requirements come easy if you consider all that fish and shellfish have to offer. To help you with your planning, the United States Department of the Interior's Bureau of Commercial Fisheries has released a new, 16 page, full-color, diet booklet, Seafood Slimmers, which is available by sending 25¢ to the Superintendent of Documents, Washington, D. C. 20240.



Chef's Salad Chesapeake and Cod Curry are meals with minimal calories, maximum flavor and eye appeal which are easy to prepare.

Thaw frozen fillets. Skin fillets and place in a single layer in a greased baking dish, 12 x 8 x 2 inches. Cook the celery and onion in fat for 5 minutes. Stir in seasonings and milk. Spread over fish. Bake in a moderate oven, 350° F., for 25 to 30 minutes or until fish flakes easily when tested with a fork. Sprinkle with paprika. Serves 6. Approximately 140 calories in each serving.

STATES

Alaska

FISHERY PRODUCTS ARE MOST VALUABLE IN ITS 100TH YEAR

In the centennial year of its purchase from Russia for \$7.2 million, the value of Alaska's processed fishery products is over \$125 million a year, twice the next most valuable industry--forest products worth \$58 million.



Oregon

UMATILLA INDIANS SEEK TO ESTABLISH COHO SALMON RUN

A campaign to restore coho (silver) salmon in the Umatilla River of Northeastern Oregon has been launched by Oregon State and Federal agencies in cooperation with the Umatilla Confederated Indian Tribes. Coho runs flourished in this stream before the development of the region destroyed them.

A major step in the program was taken with the planting of 500,000 coho eggs on the Umatilla Indian Reservation about 12 miles east of Pendleton, Oregon. The eggs were planted in wooden incubation boxes designed by BCF and installed in special facilities constructed by the Indians in fall 1966.

Officials of the U. S. Fish and Wildlife Service hope that many of the half-million eggs will hatch into baby salmon in about a month; then, after living in the river for about a year, will make the long journey to the Pacific Ocean via the Columbia River. Those that survive the rigorous trip and the sea's perils will return to the Umatilla River 2 or 3 years later to spawn--reestablishing the coho runs.



North Carolina

CALICO SCALLOP FISHERY THRIVES

For the past few months, 7 to 10 vessels have been landing daily 500-600 bushels per vessel of calico scallops in Morehead City, N. C. The vessels normally operate 5 days per week and most of the catch is processed by 2 shucking plants. The weekly production is about 300,000 pounds (pints) of meats.

Several factors aided the development of this fishery: BCF's exploratory operations delineated the resource; its technical assistance familiarized local fishermen with scallop dragging techniques; State and local interests combined to promote use of this resource.



Washington

PUGET SOUND HAKE FISHERY SHOWS PROMISE

From the season's start in late October 1966 through mid-January 1967, 2 million pounds of hake were landed in the Saratoga Passage-Port Susan area of the Sound. Most of the fish were landed by one vessel using midwater trawls. Later, 3 more trawlers joined the fishery.

BCF's Seattle-based gear specialists have provided technical assistance to these vessels in the design and use of midwater trawls, and in installing depth telemetry systems. The fishery normally lasts until June and is expected to surpass last year's 6½ million pounds.



Virginia

FOSSIL OYSTERS FOUND ON CONTINENTAL SHELF

A clump of large oyster shells was seined from the bottom in 90 feet of water, several miles off Chincoteague, by Captain Herbert Freeman of the "Elsie Jane" working out of Hampton, Virginia. According to Dr. J. D. Andrews, Virginia Institute of Marine Science, these are shells of Virginia oysters--but oysters do not grow in water deeper than 50 feet, nor offshore in the open ocean.

There are indications that about 10,000 years ago many lagoons and estuaries existed over the present continental shelf. Many fossil oyster shells have been collected from shelf waters along the Atlantic coast. Radio-carbon techniques indicate that these oysters were alive about 9-11,000 years ago.



BUREAU OF COMMERCIAL FISHERIES PROGRAMS

It sought "ground truth" for
Gemini XII's photography

CRUISE "DELTA I" OF THE "GERONIMO"

By Reed S. Armstrong, John R. Grady, and Robert E. Stevenson*

On November 8, 1966, the R/V "Geronimo" sailed from Galveston, Tex., for the Mississippi River Delta to acquire oceanographic

information on the sparsely sampled Delta area and to obtain "ground truth" for the photography of the Gemini XII manned space-

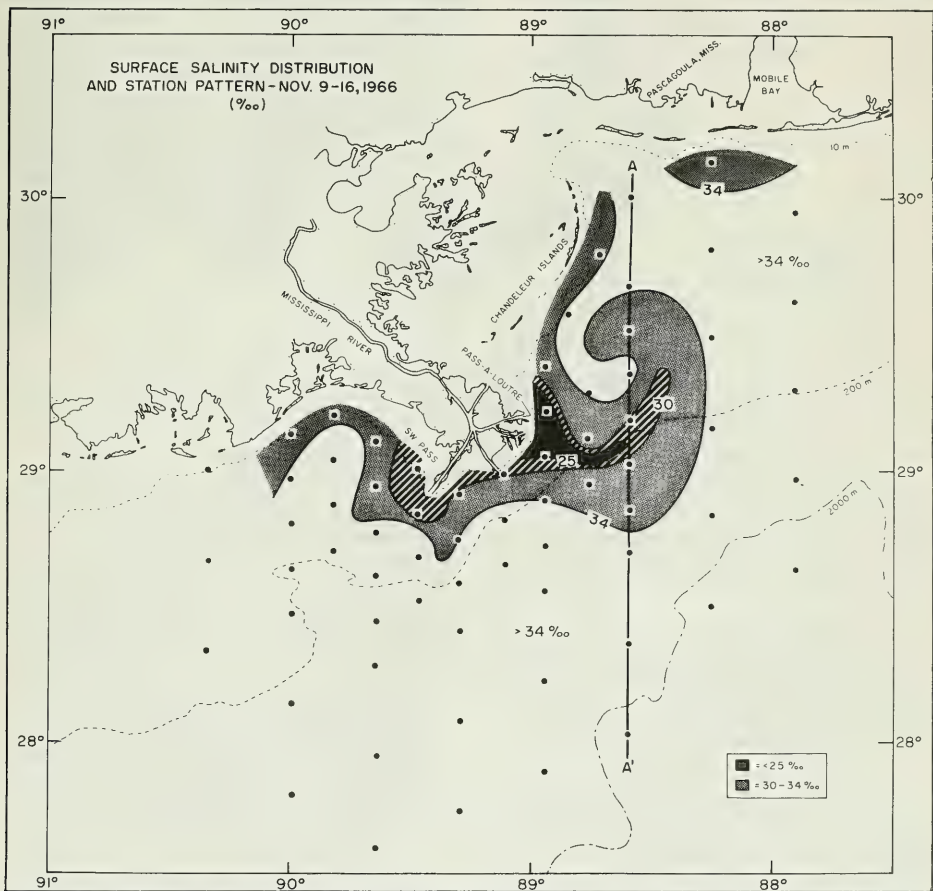


Fig. 1 - The surface salinity distribution around the Mississippi Delta, November 9-16, 1966. Note the eddy northeast of the Delta.

*Research Oceanographers, BCF Biological Laboratory, Galveston, Texas.

Note: Contribution No. 231, Bureau of Commercial Fisheries Biological Laboratory, Galveston, Tex.

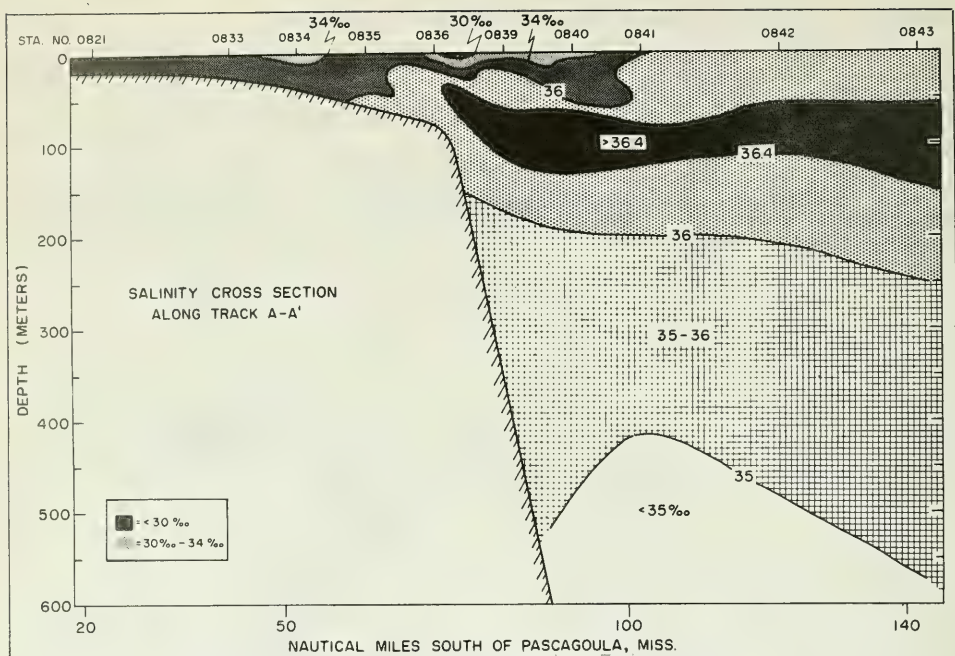


Fig. 2 - A salinity section through the eddy northeast of the Mississippi Delta. The vertical distribution around the eddy is apparent in the waters off the edge of the shelf.

flight. Cloudiness over the Delta prevented execution of the spacecraft's photographic mission, but the data gathered from the Geronimo are excellent. Because of the grid of stations, it is possible to describe features of the scale that have been observed in previous spaceflight photographs of other ocean areas.

Sixty-nine hydrographic stations were occupied from November 9-17 south of the Louisiana, Mississippi, and Alabama coasts. (See fig. 1 for station plan.) To gain an idea of the continuity in the waters, nine stations were reoccupied during the cruise.

The distribution of properties was more complex than has been reported from historical data (e.g., see Drummond and Austin, 1958, "Some aspects of the physical oceanography of the Gulf of Mexico," U. S. Fish and Wildlife Service), and is best exhibited from the salinity and oxygen content.

The salinities varied from 13.01 p.p.t. (parts per thousand) at the surface off Pass-a-Loutre to 36.7 p.p.t. at depths of 150 m. at the stations farthest offshore. In the surface distribution of salinity of figure 1, the 34-p.p.t. contour delineates the brackish, nearshore water. The 30-p.p.t. line defines the pattern of flow of the water discharged from the Mississippi River; and the 25-p.p.t. contour represents the greatest seaward extension of river water.

Water from Southwest Pass moves along two main tongues, one to the west (which curves to the southwest offshore) and the other parallel to the first but more to the south. Counterflows of oceanic water between the tongues produce rapid mixing of the brackish river water. Lesser volumes of river water flow north and east, following the coastline.

The discharge from Pass-a-Loutre splits into two flows, one to the north and the other

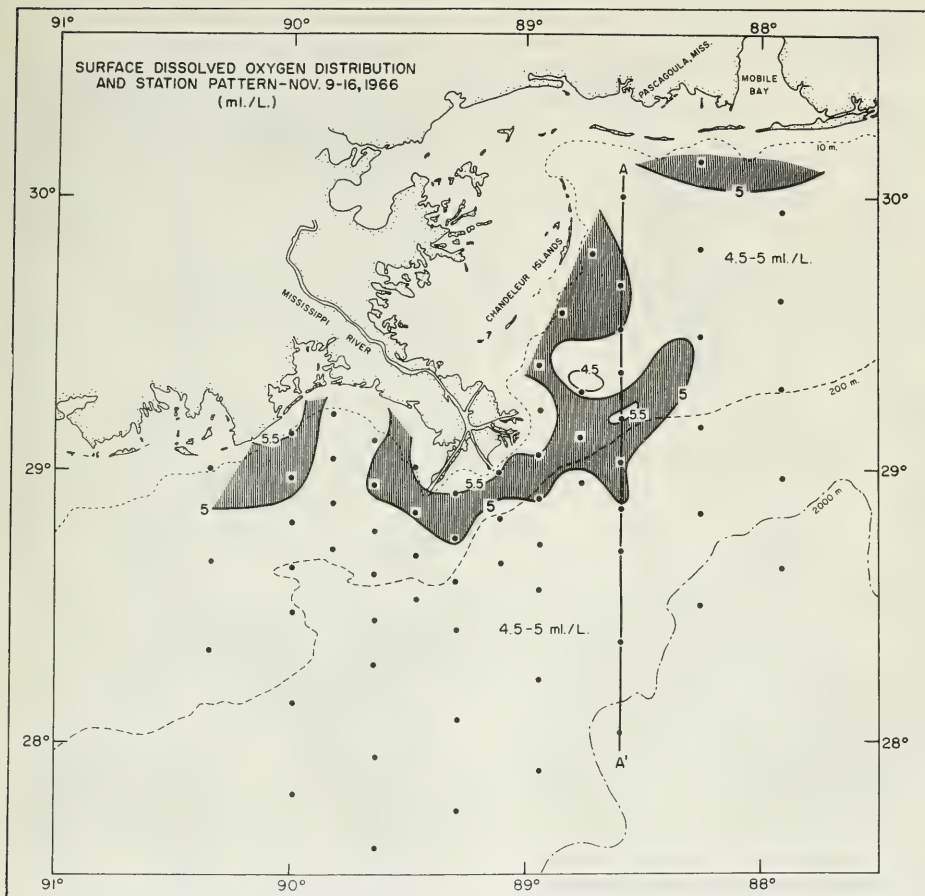


Fig. 3 - The surface oxygen distribution, November 9-16, 1966. The conformity with the salinity and the river discharge is clear. The waters with an oxygen content of 5-5.5 ml./L. are indicated by shading.

toward the southeast. The northerly flow remains nearshore. The river water that moves southeasterly feeds into a cyclonic eddy that is about 150 km. in diameter. This eddy is apparently maintained by a current that moves westerly off Mobile Bay and turns south off the Chandeleur Islands, and by a northeasterly current offshore of the Delta. The eddy is probably a semipermanent feature as these currents are at least semiprevailing circulations.

The salinity cross-section of figure 2 depicts additional features of the waters around the area of the eddy. As in figure 1, the water of <30 p.p.t. represents the river discharge; the areas of <34 p.p.t. represent the nearshore water and regions of >34 p.p.t. indicate the oceanic waters. The eddy in this section is contained between stations No. 0833 and No. 0841 and the center is at about station No. 0835. Because of the cyclonic curvature, the surface water is drawn to the outside of

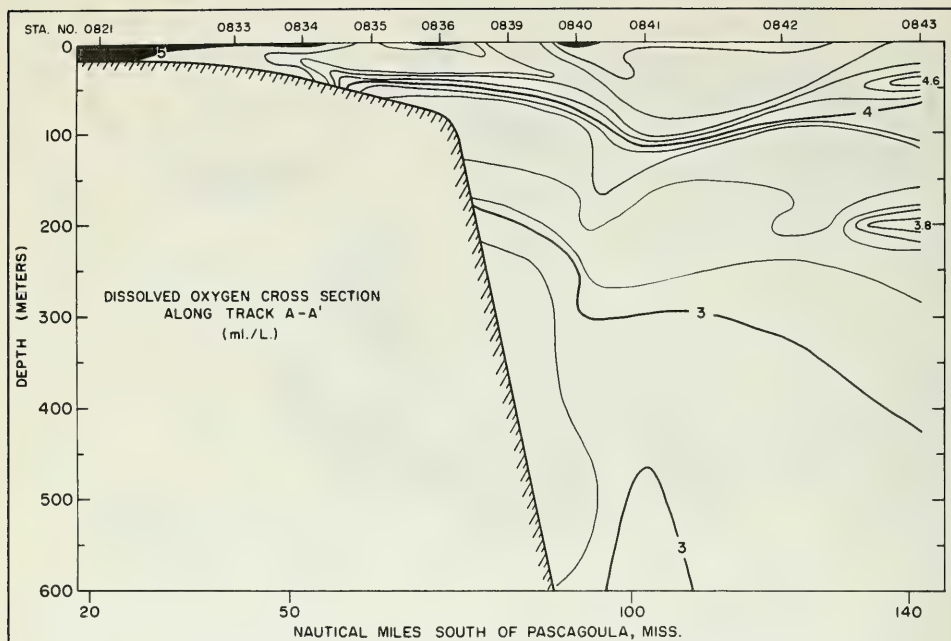


Fig. 4 - An oxygen section through the northeast eddy. The conformity with the salinity is clear.

the flow causing the surface water of <34 p.p.t. salinity to spread to the south in the southern portion and northward in the northern portion of the eddy. On the boundary of the eddy, surface water downwells between stations No. 0840 and No. 0841. Also as a result of the cyclonic curvature, subsurface water upwells in the center of the eddy.

The effects of the circulation around the eddy extend to a depth no greater than about 225 m. The deep upwelling represented by the rising 35-p.p.t. contour is probably associated with the offshore northeasterly current.

The distribution of dissolved oxygen (fig. 3) off the Delta distinctly reflects the pres-

ence of the northeast-trending eddy defined by the salinity distribution.

Around the Delta the inshore water has a gradient from 4.78 to 5.84 ml./L., at the surface. West of the Delta, however, the intrusion of a lobe of offshore water, with an oxygen content of less than 5 ml./L., is apparent. To the south of Mobile Bay, highly oxygenated water was at greater depths.

Offshore, the surface pattern of the oxygen distribution is broken by upwelling of water of lower oxygen content associated with the eddy (fig. 4). The area east of the Delta where the surface oxygen values are >5.00 ml./L. appears to coincide with the axis of the eddy.



Central Pacific Fisheries Investigations

"CROMWELL" STUDIES RELATION BETWEEN BIRDS, SURFACE SCHOOLS, SONAR TARGETS

The Townsend Cromwell continued its sonar studies during Cruise 28 (Oct. 21-Nov. 16, 1966) between 12° and 18° N. along long. 155° W.

Major Missions and Results

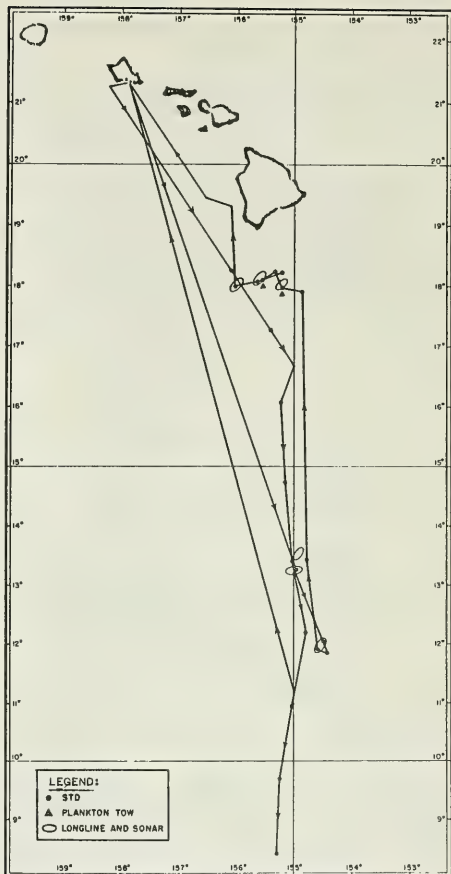
A primary mission was to examine the relation between the occurrence of bird flocks, surface schools, and sonar targets in areas of deep and shallow thermocline depths.

Sonar surveys from the surface to a depth of 400 m. were made in areas where the top of the thermocline to the bottom was 30-200 m. deep (lat. 12° - 13.5° N.) and where it was 60-300 m. deep (lat. 18° N.) along long. 155° W. In addition to the three 24-hour periods of sonar surveys in each area, there were 3 longline stations and 6 days' watch of standard bird flock and surface school in each area. Table summarizes the sonar and watch results. Conclusions must await closer examination of the effects of variable sea conditions and sonar performance encountered during the cruise. The skipjack sighted were small--ranging from an estimated 25 cm. to a measured 40 cm. in fork length. The 3 schools of skipjack were not accompanied by birds.

Numbers of Sonar Targets, Bird Flocks, and Fish Schools				
Position	No. of Sonar Targets		No. of Bird Flocks	No. and Species of Fish Schools
	Surface	>10 m.		
12° - 13.5° N., 155° W.	10	31	5	5 unidentified, 3 skipjack.
18° N., 155° W.	8	14	2	2 unidentified.

Another mission of the cruise was to examine the relation between depth of targets located by sonar and the temperature, light, and salinity profiles of the environment.

STD casts to 500 m. were made at the beginning of each sonar survey and after each setting of the longline. Strong winds and changing light conditions precluded the successful use of the irradiance meter. In the shallow thermocline area, the 31 nonsurface targets (>10 m. deep) were distributed irregularly in depth, but they were found at al-



Track chart for Townsend Cromwell, Cruise 28.

most all depths down to 284 m. The most noticeable gap in distribution was between 130 and 160 m. and generally coincided with the depth of the salinity minimum. In the deep thermocline area, 11 of the 14 nonsurface targets were at 90-160 m., 2 at 20-40 m., and 1 at 240-250 m.

The Cromwell also collected temperature and salinity data to and from operation area and recorded and transmitted routine BT and weather information.

Notes: For more information, contact Area Director, Bureau of Commercial Fisheries, P.O. Box 3830, Honolulu, Hawaii 96812.

U.S. FISH AND WILDLIFE SERVICE

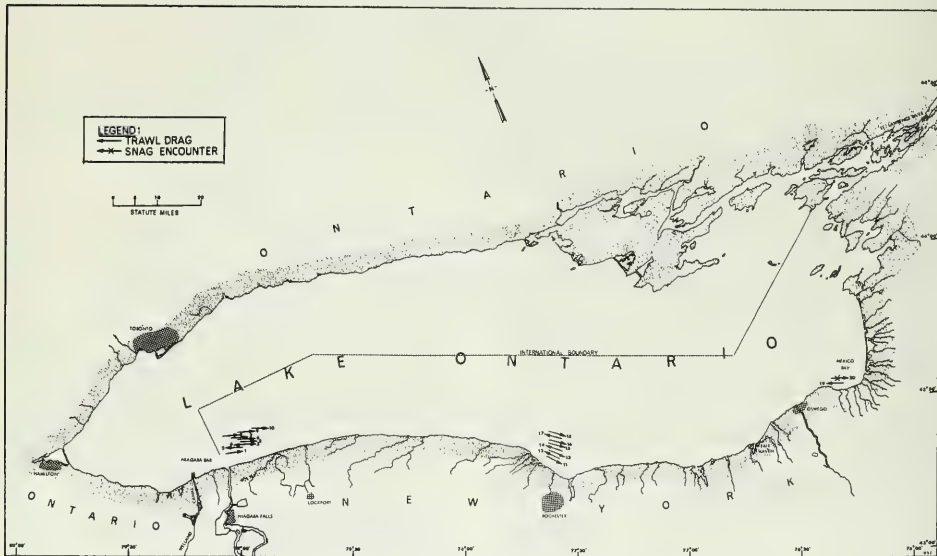
Great Lakes Fisheries Explorations and Gear Development

"KAHO" CATCHES MANY ALEWIFE, FINDS GOOD TRAWLING GROUNDS

The R/V Kaho conducted a 15-day fishing survey of the U. S. part of Lake Ontario to gain information necessary for future operations. (Cruise 37, ended Nov. 15, 1966.) The crew studied the location, relative abundance and distribution of commercial fish stocks, their availability to bottom trawls, and the nature of areas suitable for trawling. Fish samples were collected for biological and pesticide studies.

cordings revealed extensive and widely distributed schools from one end of U. S. part to the other.

Fishing Results: Total production was 8,539 pounds--97.6 percent alewife and 2.3 percent smelt--taken in only 9 hours and 50 minutes of fishing time. Other species amounted to only 7 pounds. Commercially significant catches of alewife of 700,440 and 900 pounds per drag were taken off Niagara Bar at 20, 25, and 45 fathoms, respectively. Off Rochester, 4 drags produced 630 to 1,500 pounds of alewife (average 1,158 pounds) at 15 to 30 fathoms. The best catches of smelt (40 and 30 pounds) off Rochester were taken at 15 and 20 fathoms.



Lake Ontario explorations, R/V Kaho Cruise 37.

Highlights: (1) Large catches, almost all alewife, as large or larger than those in Lake Michigan during this time of year. (The 1966 forecast for the new Lake Michigan alewife fishery was for over 30 million pounds.) (2) Ideal bottom trawling grounds extending from 10 to 50 fathoms along most of Lake Ontario's south shore. Exceptionally good trawling grounds were found minutes away from Youngstown, N. Y. (Niagara Bar) and Rochester, N. Y. Continuous echo-sounder re-

Hydrographic Data: Bottom (fishing) temperatures ranged from 41° F. to 43° F., surface temperatures ranged from 44 to 46 degrees.

Note: For more information, contact East Director, Exploratory Fishing Base, BCF, 5 Research Drive, Ann Arbor, Mich, 48103.



Alaska Fisheries Explorations and Gear Development

"MANNING" CONDUCTS SHRIMP SURVEY OFF SOUTHEAST ALASKA

The M/V John R. Manning returned to Juneau December 16, 1966, after a 6-week exploratory shrimp survey in the Icy Strait and Ernest Sound areas of southeast Alaska (Cruise 66-4).



Fig. 1 - General area of operation, Cruise 66-4.

Principal cruise objectives: (1) to locate commercial concentrations of the larger pandalid species, spot shrimp (*Pandalus platyceros*) and coonstripe shrimp (*P. hypsionotus*), and (2) to test the relative fishing efficiencies of 6 types of shrimp pots. Secondary objectives: to gain information on the catching efficiency of tickler chain-rigged and roller gear-rigged shrimp trawls.

Best catches of shrimp in the northern area (see figure 2) were made in Charpentier Inlet, Glacier Bay, where 15 strings set between the 47 and 84 fathom depth contours produced 240 pounds of coonstripe shrimp. These shrimp averaged 19.85, and ranged from 15 to 28 whole shrimp per pound.

Four drags were made with the 40-foot shrimp trawl, 3 with the tickler chain-rig, and one with the roller-rig. A significant reduction in numbers of crabs, miscellaneous invertebrates, rocks, and other debris occurred in the set with the roller-rigged trawl.

In general, commercially significant quantities of shrimp were not located in the northern area of operations.

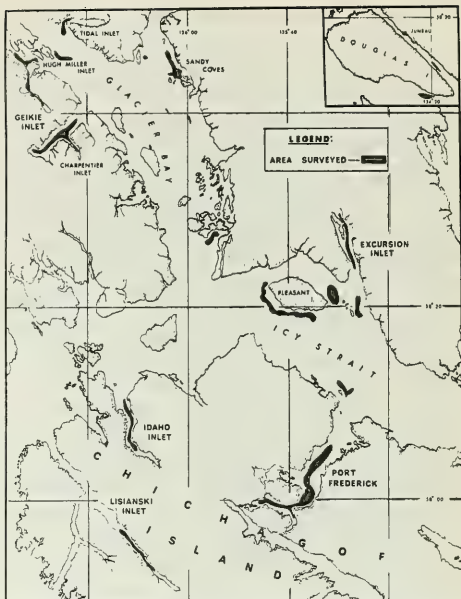


Fig. 2 - Northern area of operation, Cruise 66-4.

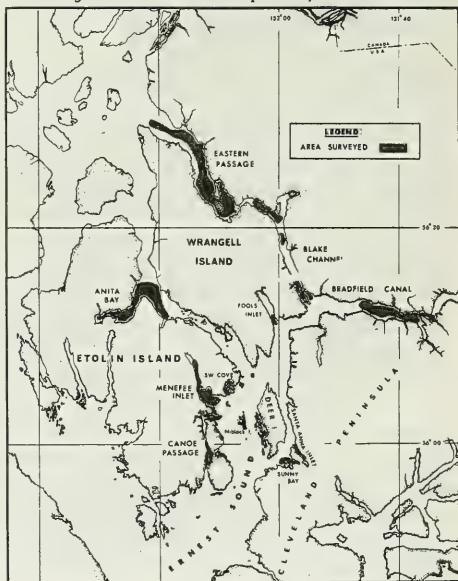


Fig. 3 - Southern area of operation, Cruise 66-4.

South Area Has Commercial Quantities

Results from the southern area (see figure 3) indicate that commercial quantities of spot shrimp are available in the lower section of Ernest Sound, on the eastern side of Etolin Island, between the 22 and 84 fathom contours. Six strings set in Canoe Passage produced 64.8 pounds of 20 count spot shrimp. Twelve strings set in Nenefee Inlet produced 65 pounds of 8 count spot shrimp, and 19.2 pounds of 24 count coonstripe shrimp. Six strings set in Southwest Cove captured 97.3 pounds of 9 count spot shrimp, while 6 strings set just north of Canoe Passage captured 40.4 pounds of 13 count spot shrimp.

Catches of over one pound per trap are considered commercially significant. The average size of the cocktail size (spot) shrimp taken was 11.4 per pound whole weight, and ranged from 4 to 20 count.

Note: For more information, contact Base Director, Exploratory Fishing and Gear Research Base, BCF, P.O. Box 1668, Juneau, Alaska 99801. Telephone: 586-7233.



North Atlantic Fisheries Explorations and Gear Development

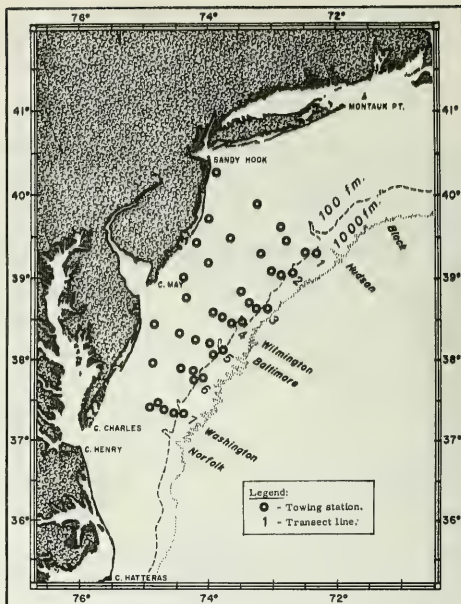
"DELAWARE" EXPLORES CONTINENTAL SHELF SPACE

The M/V Delaware returned to her home port of Gloucester, Mass., on December 15, 1966, after completing the first in a series of cruises planned to survey seasonally the trawl fisheries resources of the Middle Atlantic Bight area--Hudson Canyon to Cape Hatteras (Cruise 66-11). A second winter cruise was scheduled for February 1967 to complete the area not covered in the first.

Generally, catches of fish have been fairly small. Except for scup and lobster, the quantities of fish and shellfish found probably were not of commercial significance.

Procedure

The survey area is to be sampled systematically by fishing the same stations during each season. The stations have been arranged in transect lines extending across the general slope of the bottom from near the coastline to the Continental Slope. The lines are spaced



Survey area of M/V Delaware Cruise 66-11.

about equally and, generally, about perpendicular to the coast. There are 12 transect lines between the western side of Hudson Canyon and the offing of Cape Hatteras.

Fishing stations are positioned along the transect lines at depths of 10, 20, 35, 50, 75, 100, 250, 400, 600 (and possibly 800) fathoms. However, minor changes in positions (and transect lines too) are required sometimes because of known wrecks, hard bottom telephone cables, submarine transit lanes, etc.

Commercial style fishing gear is used: roller rigged, nylon, #41 "Yankee Trawl" nets (70-foot headrope, 100-foot footrope) with suitable size, commercial type, bracket hung doors (10' 6" length).

Results

During cruise 66-11, 42 stations were fished--40 at planned sampling stations, 2 in unscheduled depths or positions. The crew fished all planned stations on the Continental Shelf between 10 and 100 fathoms, inclusive, lying between Hudson Canyon and the offing of Wachapreague Inlet Buoy, about 35 miles northeast of Cape Charles--except for two

10-fathom stations at transects 6 and 7. The area covered is about two-thirds of the Shelf area to be surveyed; the February cruise is scheduled to fish all Slope stations.



An inshore catch before and after emptying into checker.

Although many of the scup (Stenotomus versicolor) were of maximum size, the amount taken probably would not sustain commercial fishing except for draggers with smaller crews. Several commercial fishing vessels were observed trawling near the Delaware's best scup catches.

Lobsters (Homarus americanus) occurred in 30 of the 32 catches taken from 35 fathoms or more. However, the best quantities were taken in 100 fathoms. The largest catch was 5 bushels, weighed 190 pounds, and was taken on a 1-hour tow (position: 1H4-4188; 1H5-2690).

Only 6 berried females were in it. In contrast, one 4-bushel catch taken at 75 fathoms contained 38 egg-bearing females.

Squid were the most prevalent species found and occurred in all except 2 catches. Largest was 8 bushels from 1-hour tow at 75 fathoms. Two species were mixed in catches: common (Loligo pealii) and sea arrows (Ommastrephes illecebrosa).

Dogfish (Squalus acanthias) were most abundant in about 35 fathoms or less, but were taken to depths of 100 fathoms.

Note: For further information, contact Dr. John R. Thompson, Acting Base Director, or Ernest D. McRae Jr., Exploratory Fishing and Gear Research Base, State Fish Pier, Gloucester, Mass., 01930, Telephone: 617-283-6554.



What A Tuna Can See

A skipjack tuna can distinguish an object the size of a pinpoint 2 feet away from its nose. Other fishes that live in the upper levels of the ocean also are remarkably sharp-sighted, scientists are finding.

For several years, Eugene L. Nakamura, biologist at BCF's Biological Laboratory, Honolulu, has been studying the vision and behavior of the commercially important tunas. The laboratory has conducted other processing investigations in this field. Using his techniques, the Laboratory has been able to keep tunas alive for research in its shore-side tanks for months on end. It is the only place in the world where these large and active fish are regularly available for experiment.

The skipjack tuna (Katsuwonus pelamis), a relatively small and very plentiful fish, is of particular interest to the Laboratory because it forms the mainstay of Hawaii's chief commercial fishery. Also, several studies conducted by the Laboratory indicated that a very large, untouched stock exists in the central Pacific.

Nakamura has been studying the ability of tunas to see clearly the fine details of objects, especially as they become smaller and move closer together. Few such measurements of any fishes existed, and none of the much-sought fishes of the high seas.

Worked In Sunless Tank House

He worked in a black-painted, sea-water tank house in a sunless building. At the end of the long, narrow tank there was an opal glass plate on which an image could be projected. The image had a pattern of black-and-white stripes of equal width.

A fish soon learned that if the stripes were vertical it would receive a morsel of food at a certain place in the tank. However, if the stripes were horizontal, and it tried to swim to the food-drop area, it would receive no food--and, to impress the lesson upon it, a mild electric shock.

When the fish was trained and testing began, horizontal and vertical stripes were presented at random. The luminance of the stripes was decreased in steps until the fish began to make errors in half the tests. On following days, the fish would be presented with patterns in which the stripes were narrower or broader. In this way, the visual acuity of the skipjack and a related species, kawakawa, or little tunny, was determined.

Nakamura found that when the white stripes were dim, the fish saw about equally well, but when they were brighter, the skipjack's visual acuity was greater.

There is evidence that sight is important to tunas in detecting prey and avoiding predators. Nakamura says it also is used to recognize transient and permanent body marks. Several fishes exhibit transient color markings at certain times, such as feeding or courtship. These markings may convey information about the presence of food to other fish in the school, or signal aggressive intentions. Certain permanent body marks may aid a fish distinguish its own kind from others closely resembling it.

Can See Pinpoint On Clear Day

Nakamura was able to calculate from his measurements how far the skipjack could see prey or body marks under certain conditions. On a clear day, a skipjack tuna about 100 feet down could see an object a few hundredths of an inch long 2 feet away. It could see the transient vertical bars on the flanks of another skipjack about 35 feet away. Permanent body marks on another skipjack would be resolvable at distance of about 10 feet. Nakamura points out, however, that contrast be-

tween the object and its background may be as important, or even more, than visual acuity; he was unable to measure contrast. He reports that British workers recently found that the scales of some fishes are ingeniously oriented to reduce contrast between their bodies and the background.

What Nakamura's studies may mean to the fishermen lies in the possibilities they offer of devising improved new gear and techniques for catching fish. Such gear and techniques would be based on scientific studies of the fishes' perceptual abilities and knowledge of their behavior.



La Jolla First to Raise Mackerel and Sardines to Advanced Juvenile Stage

Pacific mackerel and sardines have been raised from egg to "advanced juvenile stage" for the first time anywhere by researchers of the California Current Resources Laboratory at La Jolla.



Fig. 1 - Pacific mackerel, 6-8 inches long, reared from the egg, photographed during the week of October 10. Fish were hatched May 20, 1966. (Photo: George Mattson)

Several hundred Pacific mackerel hatched in May 1966 reached 10 inches by year end, attained about half the adult size. Sardines hatched in August 1966 were four inches long, about one-third adult size. Using an experimental aquarium supplied with sea water, Dr. George O. Schumann has reared at least 15 species of marine fish from egg to late juvenile stages.

Dr. Schumann notes: "A key to the success of these experiments is to feed the

proper food at the proper time." He reported that very young fish were fed small amounts of natural plankton (microscopic ocean plants and animals). As the fish grew, they were fed larger amounts of plankton, and also brine shrimp. With a lot of food and warm water some species more than doubled in length during their first two weeks of life.

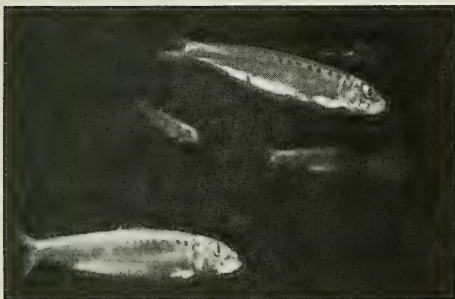


Fig. 2 - Sardines, $2\frac{1}{2}$ to 4 inches long (standard length) photographed during the week of October 10. School has about 50 specimens with a rather wide difference in size. The sardines shown were hatched August 11, 1966. (Photo: George Mattson)

Studies Needed For Conservation of Species

Dr. E. H. Ahlstrom, Laboratory director, said Pacific mackerel and sardines are being studied to gather information needed to conserve and manage the species. "Our successful experiments will enable scientists to study the life history and habits of these fish under controlled conditions. This is one of the most important recent developments in marine fishery biology. Information on marine fish larvae and factors influencing survival will enable scientists to better understand changes in abundance of commercial fish populations. "Rearing and studying the larvae in the laboratory will ultimately provide information leading to international cooperation in regulating the high seas fishery."

Pacific mackerel are an important West Coast fishery. But sardines, the mainstay of a prosperous fishery in the mid-1940s, have become scarce.



La Jolla's Tuna Vessel Research Pays Off

The results of a study by BCF's Tuna Resources Laboratory at La Jolla and a Van Camp Seafood Co. representative have stimulated a tuna vessel fleet owner to convert its vessels for maximum efficiency at relatively modest cost. The study determined the optimum size of tuna vessels that would give maximum return for the effort and money expended. Based on the study, National Marine Terminals of San Diego has started to convert its 12 vessels from about 340 tons carrying capacity to 420 tons--a figure close to the most efficient size of tuna seines disclosed by the study.

The cost of converting each vessel is \$75,000. When the project is completed, the fleet's carrying capacity will be 960 tons greater--equivalent to adding 2 new vessels costing \$2 million. The company believes the \$900,000 program is worthwhile.

BCF's support of its La Jolla Operation Research Program during the study period was much less than \$50,000.



King Crab Waste, A Pollutant, Becomes Salable Fish Meal

BCF's Ketchikan (Alaska) Technological Laboratory has used king crab waste to make fish meal, a development that may help to reduce pollution in Kodiak harbor and provide additional income to the king crab industry.

The pollution situation became a real concern to Kodiak when the post-earthquake buildup brought an increasing number of processors and vessels to the area. It was estimated that about 300,000 pounds of butchered waste were dumped into the harbor daily during the peak of the 1965 processing season. The City of Kodiak was forced to enact a stringent pollution-control ordinance.

The reduction process for making meal from crab waste is much easier than it is for other fish byproducts because expensive cookers, presses, and oil recovery equipment are not necessary.

The Ketchikan technologists began to study the possible use of crab meal as animal feed. Using butchering waste only (shell, viscera, and blood), they produced a small quantity of meal containing about 45 percent protein--a surprisingly large amount. If this protein has the same nutritional value (digestibility) as fish meal, it now would be worth \$105-\$120 a ton.

The technologists went on to a more elaborate experiment. They obtained 5,000 pounds of crab butchering waste and processed it. About 600 pounds will be fed to mink at Petersburg in a cooperative study with the Experimental Fur Farm. The remainder will be used in feeding trials with rats and chickens at the BCF lab in College Park, Md., to compare crab meal protein with fish meal. If the results are favorable, the production of crab meal could lessen the pollution problem at processing centers and add income to the industry.



Holds Sanitation Workshops to Aid Industry

To help several elements of the food processing industry cope with the increased sanitation surveillance of the Food and Drug Administration (FDA), FDA's Bureau of Education and Voluntary Compliance and BCF's Technology and Inspection staff are initiating sanitation workshops for the breaded shrimp and smoked fish processing industries.

The workshops, scheduled to start in early spring, will be held in the Gulf States and in New York City.



Boothbay Lab Studies Lobster Habitat Improvement

An artificial reef built with rock blasted and dredged from the site of a new Coast Guard station is being studied intensively by the BCF Boothbay Harbor (Maine) laboratory's SCUBA diving team. The information gained may help determine the best ways to construct new areas suitable as lobster habitat--and also ways of upgrading marginal areas.

A photographic survey is being made of the reef, which covers about 10,000 square feet of ocean bottom near the mouth of Boothbay Harbor, Maine, in 50 to 80 feet of water. This reef is only 2 months old, but the apparent density of lobsters is already half that of an adjacent natural habitat. Bimonthly photographs of reef parts will document the colonization of the reef by marine organisms; the lobster population will be monitored each month. Besides lobsters, shorthorn sculpins, cunners, and rock eels occupy the reef.



Gloucester's Prototype Shrimp Separator Shows Merit

A shrimp separator designed, built, and tested by the Gloucester Exploratory Fishing Base staff has proved successful in separating small shrimp from trash fish and debris taken together in shrimp trawling operations. Because the shrimp are small and bring a low price, the mechanized separator may make this new fishery more attractive to potential fishermen.



Atlantic Tuna Tagging Shows Definite Trans-Ocean Migration

Of 7,000 tagged tuna released in the Atlantic during 1966, over 600 returns were made during the first 10 months, some from fish tagged in earlier years. It was the second year of BCF support of the program at the Woods Hole Oceanographic Institution.

Several returns were unusually significant; they indicated the complex relation between stocks of Atlantic bluefin tuna. Twelve recoveries showed trans-Atlantic migration of young bluefin released in coastal waters between New Jersey and Cape Cod in summer 1965 and recaptured in Bay of Biscay in summer-early fall 1966. Young bluefin tagged by the Canadians showed a similar migration.

The high number of returns indicates a definite trans-ocean migration rather than accidental wandering.

East-West Migration Unknown

Although young bluefin have been tagged in the northwest Atlantic every year for 13 years, the only similar migration of young fish ever recorded was for two 20-pounders released in 1959 and recaptured in Bay of Biscay in 1959. Until tagging can be done in the Biscay, it will not be possible to know if east-west migration occurs. In the past, giant bluefin marked in Florida straits have been recaptured in Norwegian waters, one even north of Arctic Circle.

It appears that widely separated bluefin tuna stocks intermingle in unpredictable manner. International programs would be necessary to determine their complex distribution.



BCF Ann Arbor Base Explores Idea of Using LASER for Fish Detection

The possibility of using light amplification by stimulated emission of radiation (LASER) to penetrate the sea's air-water interface to locate and delimit fish schools is being explored by the staff of BCF's Ann Arbor Exploratory Fishing and Gear Research Base. Recently, the matter was discussed with engineers of a private laboratory, who proposed a feasibility study.

This is the approach of the Ann Arbor staff: if the interface can be penetrated--and reflected signals from fish schools returned--then it may become possible to conduct searches for fish schools from fast-moving vehicles such as planes or helicopters. A logical place to start testing would be over a known population of highly abundant schooling fish--using the reliable recordings of echo sounders aboard research vessels to establish the quantity of fish and to help interpret the LASER readings.

BCF's Seattle Base also is interested in the subject.



Menhaden Eggs Found Off North Carolina

A concentration of live menhaden eggs and a spawning area were found for the first time off the Middle and South Atlantic coasts by BCF scientists from the Beaufort, N. C., laboratory aboard the research vessel "Dolphin" on December 17, 1966.

The fairly dense patch of eggs, roughly 5 miles in diameter, was located about 40 miles southwest of Beaufort, N. C. Three stages of embryonic development were represented: blastoderm (about 14 hours), early neurula (24 hours) and late embryo (46 hours). Over 100,000 live eggs and newly hatched larvae were brought into the laboratory for further study of embryonic development.

The area was revisited 36 hours after the discovery and only dead eggs or yolk-sac larvae were caught. This indicates to the scientists that no further spawning had taken place, and that survivors had been carried from search area by winds and currents.



BCF Offers Reward for Tagged Fluke

Cooperating in a study by the Atlantic States Marine Fisheries Commission, BCF is offering rewards for catching tagged fluke: \$1.00 for return of tag only; \$2.00 for tag intact on the fish.

The fluke are young of the year--tagged in October 1966--when only 3 to 4 inches long. They were tagged in Bay River, Pamlico Sound, N. C., to determine how far they migrate--and whether they contribute to stocks of fluke taken farther north and east of the tagging area.

The tagged fluke are extremely small and commercial fishermen are urged to watch carefully the parts they usually discard. The help of fishermen or anyone handling fish is needed to make this study successful.

Recaptured flounder provide necessary information on migrations and growth rates of this valuable sport and commercial fish.

How To Get Reward

The tag is green, plastic, oblong, small ($\frac{1}{8}$ inch wide x $\frac{1}{2}$ inch long), and is attached to the fish by wire. It shows the message-- "SEND TAG: USFWS WOODS HOLE, MASS."

To receive reward for tag only, send it to U. S. Bureau of Commercial Fisheries Biological Laboratory, Woods Hole, Mass., with this information: (1) your name and address;

(2) where fish was caught; (3) when caught; and (4) type of gear used. To receive reward for tag intact on the fish, give it to a Federal or State Marine biologist or fisheries agent for observation and measurement, together with your name, address, and other pertinent information.

Prompt acknowledgement will be mailed in both cases with a cash reward and information on the fish tagging.



NOTE: The December 1966 issue of this magazine, page 24, "Boston Trawlers Improve Fish Handling Methods," described an improved fish washing system recently adopted by some Boston trawlers. BCF did not devise the system. The washer is the product of the Great Grimsby Coal, Salt, and Tanning Company, Limited, Grimsby, England; the hatch was designed by Usen Trawling Company, Boston, Mass.

SEA FOSSILS INDICATE MOVEMENTS OF SEA FLOOR

Africa and the Americas may have separated about 160 million years ago, drifting apart at the rate of six-tenths of an inch a year. As reported by scientists of the Lamont Geological Observatory, Columbia University, N. Y., inspection of fossilized sea creatures has shown that for the past 20 to 25 million years the continents have stayed where they are.

Well-preserved samples of fossilized marine animals five-thousandths of an inch in diameter were dredged from two sites on the crest of the undersea ridge that runs down the middle of the Atlantic Ocean. The fossils called foraminifers and coccoliths were dated from the early Miocene epoch about 25 million years ago.

Some scientists have calculated that the crest of the undersea ridge is much younger than the flanks and that the ocean floor crusts become progressively older toward the continents. These scientists adhere to the theory of continental drift-- the idea that the continents were once joined together and then drifted apart through the ages to create the Atlantic and Indian Oceans. Other scientists oppose the drift theory saying that the locations of the continents, ocean basins and crust are permanent. (Reprinted, with permission from Science News, weekly summary of current science, c 1966 by Science Service, Inc.)

INTERNATIONAL

U. S. and Japan Discuss New U. S. 12-Mile Zone

On January 3, 1967, U. S. and Japanese delegations concluded preliminary talks in Washington concerning the continuation of Japanese fishing operations in the new U. S. fisheries zone established by Public Law 89-658 in October 1966. The new law extends U. S. jurisdiction over fisheries to 9 miles from the 3-mile territorial sea, or a total of 12 miles from the coast. It provides for continuation of traditional foreign fishing in the new zone recognized by the U. S.

The U. S. said the extension of its jurisdiction was consistent with international law. However, it indicated readiness to hear and consider the Japanese views on the law and the continuation of their fisheries in the new zone.

Japanese Disapprove

The Japanese said they could not approve the unilateral establishment of such a fishing zone. Under international law, they declared, their fishing vessels should not be prevented from conducting fishing activities freely in the zone unless Japan agrees. They presented data which, in their view, indicated that Japan had conducted various kinds of fisheries in the 12-mile zone--in the Bering Sea, the Pacific Ocean, the Gulf of Alaska, and the Atlantic Ocean.

Despite the difference, the delegations discussed possible arrangements concerning Japanese fishing operations in the new zone.

Discussions were expected to resume February 6.



Central American Fisheries Development Commission

HOLDS FIRST MEETING IN SAN SALVADOR

The Central American Fisheries Development Commission (CAFDC) held its organizational meeting in San Salvador from Novem-

ber 7-10, 1966. Thirty-five delegates and advisors came from Central and South American countries (including Mexico) and the United States and international organizations (such as UN's Food and Agriculture Organization).

CAFDC will manage a 6-year, jointly financed fishery development project. Dr. Vasconcelos, the FAO-designated Project Director, outlined the regional situation, its prospects, and the proposed work plan for the year ahead. Some international experts already are available to carry out parts of the project. The first exploratory fishing vessels have arrived in the area.

A country-by-country rundown of national fisheries developments showed that fisheries to date have been largely neglected. The exception was Panama, which has made considerable progress in recent years, largely because of private enterprise.

Manuel Rafael Arce, El Salvador's Sub-secretary of Economy, was named President of CAFDC, and Rodrigo Salmerón, Nicaragua's Vice-Minister of Agriculture, Reporter.

Regular meetings of CAFDC will be held about every year, but meetings may be called at any time to discuss urgent matters. The next regular meeting will take place in San José, Costa Rica. (U. S. Embassy, Guatemala, Nov. 25, 1966.)



FAO Conducts Orientation Cruise for Barbadian Fishermen

Barbadian trainee fishermen adjusted satisfactorily to long-line fishing, a method new to Barbados, during the first orientation cruise of the "Calamar," one of two 82-foot multipurpose exploratory vessels provided by the UN's FAO for its Caribbean Fisheries Development Project. Exploratory fishing operations for the entire project are under BCF direction through a contract with FAO.

The Calamar, based in Bridgetown, Barbados, returned with yellowfin and albacore tuna, swordfish, blue marlin, sailfish, and shark.



Law of the Sea Conventions

MEXICO AGREES TO ALL 4 CONVENTIONS

Mexico has agreed to the 4 conventions in the Law of the Sea Conventions: on the Territorial Sea and the Contiguous Zone, the High Seas, Fishing and Conservation of the Living Resources of the High Seas, and on the Continental Shelf. (Department of State.)



Asian Tuna Conference Postponed Until Spring

The Asian tuna conference between Japan, South Korea, and Formosa, originally scheduled for Tokyo December 1966, was postponed until spring 1967 because Formosa could not attend. (Okinawa will attend as an observer.) The conference was proposed by the Japan Federation of Tuna Fishermen's Cooperative Associations (NIKKATSUREN).

The three countries will discuss common fishery problems and seek ways of preventing disruption of tuna prices in the export market. ("Suisan Keizai Shimbun," Dec. 9, 1966.)



12th International Congress of Refrigeration

TO MEET THIS SUMMER

The XIIth International Congress of Refrigeration will be held in Madrid, Spain, August 30-September 6, 1967. The quadrennial Congress will examine the progress made by science, technology, and economics in refrigeration. More than 2,000 participants are expected. Previous meetings were held in Vienna, Chicago, London, Rome,

Buenos Aires, The Hague, Copenhagen, and Munich.

The program will include 3 plenary sessions: 1st session: (a) low temperatures in generation and transmission of electric power; (b) latest developments in insulating materials and techniques; 2nd session: (a) liquefaction, storage, and transport of natural gas; (b) refrigeration as applied to desalination of sea water and brackish water; 3rd session: aids to refrigeration for preservation of perishable foodstuffs.

Also, the 9 scientific and technical committees of the International Institute of Refrigeration will meet to discuss reports to the Congress.

For additional information write: General Secretariat, XIIth International Congress of Refrigeration, Centro-Experimental del Frio, Serrano, 150, Madrid-6, Spain.



Scandinavian Nations Agree on Access to Skagerrak and Kattegat

Norway, Denmark, and Sweden have signed an agreement that will permit mutual access to nearby waters of the Skagerrak and Kattegat Seas. Each country will be permitted to continue fishing in those waters within 4 nautical miles of the coastal base lines of the other two.

The Norwegian law extending fisheries jurisdiction to 12 nautical miles went into effect January 1, 1967. Denmark has proclaimed coastal base lines and is expected to put into effect a 12-mile fishery jurisdiction early this year. Swedish fishing limits are still 4 miles. (U. S. Embassy, Oslo, Nov. 20, 1966, U. S. Embassy, Copenhagen, Dec. 22 and 29, 1966, and other sources.)



FOREIGN

CANADA

BOASTS NEW RESEARCH VESSEL "E. E. PRINCE"

Memories of fisheries research in its infancy were revived at the christening of Canada's 130-foot research vessel E. E. Prince on September 17, 1966. The vessel, honoring the first head of fisheries research in Canada, will operate on the Atlantic coast out of St. Andrews, New Brunswick.



Christening of research vessel E. E. Prince.

Fishing trials were completed in December 1966. Several short research cruises are planned before the vessel undertakes the high-seas studies for which it was designed.

It will have a maximum range of 3,000 miles and cruising speed of 11 knots. The vessel is capable of stern trawling at various depths, scallop dragging, and long-lining. A modern instrument of fisheries research, it includes laboratories, specialized instrumentation for fish-finding, weather and oceanographic observations, and navigational aids. Unique features include a flume stabilization system that stabilizes the ship at sea. The system will give seamen and scientists an unusually steady platform essential to many research operations at sea.

Specially designed hinged gallows have been installed for lowering and retrieving trawls. Two hydraulic trawl winches, each capable of exerting a pull of four tons at 240 feet per minute, have been fitted to operate in synchronization or independently. A

separate winch has been installed to permit taking oceanographic samples. The propulsion machinery, located amidships, is a non-reversing direct-drive diesel engine rated at 600 British horsepower coupled to a four-bladed, controllable-pitch propeller.

Navigational and fishing aids include two radars, three echo-sounders, gyro compass, automatic pilot, Loran, Decca naviator, and radiotelephones.

The E. E. Prince will have a primary role in deep-sea programs involving pelagic species such as herring, tuna, and swordfish. But she is equipped to perform in many fields of marine research. ("Fisheries of Canada," vol. 19, no. 5, Canadian Department of Fisheries.)

* * * *

EXPANDS EAST COAST FLEET AND PROCESSING FACILITIES

Canada added 15 new stern trawlers to her east coast fleet in 1966 at an average cost of about US\$1 million per vessel. Most of them are 150-155 feet long and can hold about 400,000 pounds of fresh fish. Other vessels included 11 steel side trawlers ranging from 90 to 140 feet, 5 scalloper-groundfish draggers averaging about 110 feet, and 4 wood long-liners averaging 96 feet. Also, two 110-foot vessels were converted into herring purse-seiners. Several vessels under 90 feet also were added. Subsidies up to 50 percent of construction costs aided the fleet's expansion. Processing plant expansion in herring and groundfish industries also stimulated demand for new vessels.

And Vessels On Order

Large vessels on order include four 151-foot stern trawlers for a firm planning to open a large groundfish processing plant at Canso, Nova Scotia, in 1967; four 169-foot stern trawlers for the expanding Harbour Grace, Newfoundland, operation of another firm; and several stern trawlers of about 150 feet for a third firm opening a 60-million-pound a year groundfish processing plant near Marystown, Newfoundland.

Canada (Contd.):

The Marystown plant proposes to pay its trawler crews a guaranteed annual wage (from \$3,300 for deckhand to \$12,000 for captain); also, crews would divide a bonus of 15 percent of the gross value of the catch. Crew members would be granted time off without reduction in the guaranteed annual wage on the basis of one trip off in each five the vessel makes to the fishing grounds. ("Canadian Fishermen," Dec. 1965-Jan. 1966 and other sources.)

* * *

BRITISH COLUMBIA CANNED SALMON PACK WAS DOUBLE 1965's

The British Columbia canned salmon pack in 1966 of 1.8 million cases was double the pack of 1965 and the largest since 1962. The pink salmon pack made up 50 percent of the 1966 total and was the largest since 1962; the pack of sockeye salmon was at the highest level since the 1958 record.

* * *

FISHING LICENSES PUT ON FISCAL YEAR BASIS

The validity period for the commercial fishing licenses in Canada has been changed from calendar year to fiscal year. Annual licenses in the future will be valid from April 1 to March 31. (Canadian Department of Fisheries, Dec. 21, 1966.)

British Columbia Canned Salmon Pack, 1961-1965						
Species	1/1966	1965	1964	1963	1962	1961
			(Standard 48-Lb. Cases)			
Sockeye	407,067	245,798	343,359	158,375	297,717	398,236
King (spring)	14,548	18,891	9,127	10,000	7,174	7,927
Steelhead	2,478	843	1,262	771	815	979
Blueback	21,143	21,300	36,259	11,384	12,097	12,527
Silver (coho)	260,276	273,984	168,473	146,099	175,638	234,047
Pink	950,555	287,925	464,107	757,452	1,188,661	661,458
Chum	160,436	65,216	232,721	119,190	134,483	95,400
Total all species	1,816,503	913,957	1,255,308	1,203,271	1,816,585	1,410,574
1/Includes cases packed from salmon imported from the United States as follows: sockeye 23,057; spring 65; coho 857; pink 8,334; chum 966.						
Source: Canadian Department of Fisheries, Pacific Region, Vancouver, B. C.						



ABOUT CARP

The carp, which belongs to the minnow family, was brought into the United States in 1876. Originally native to China, it was transported to Europe in the thirteenth century. In the sixteenth, it was carried to England. Now it may be found anywhere in the world.



In the Great Lakes, commercial fishermen catch over five million pounds each year.

LATIN AMERICA

Brazil

EXPLAINS ADOPTION OF 12-MILE LIMIT

In November 1966, Brazil extended its fisheries jurisdiction to 12 miles. The Ministry of Foreign Affairs explained that the new limits are based on international practice and bring the Brazilian territorial sea and fisheries zone into line with those of Uruguay and Argentina. The Ministry stated, too, that the measure was urgently needed to defend Brazilian fisheries interests. Developing nations that possess fisheries resources can no longer permit other nations possessing large and technically advanced fleets to exploit these resources. (U. S. Embassy, Rio de Janeiro, Dec. 6, 1966.)



British Honduras

LOBSTER IS BY FAR NO. 1 FISHERY EXPORT

The export of frozen spiny lobster tails to the U. S. is an increasingly important source of foreign exchange and employment. Of 1965 fisheries exports worth US\$500,000, lobster exports earned US\$455,000. The Government places a quota on the annual spiny lobster catch, which is allocated only to local fishermen organized in cooperatives. U. S. firms handle marketing and, sometimes, finance the coops. The partnership is said to benefit both parties.

The 1966 production was expected to drop due to lower prices and catches down 40 percent from 1965. The spiny lobster season runs from July 15 to March 14 and is closely controlled by the Government. The 1966 export quota of 451,000 pounds of lobster tails was above the 1965 seasonal production of 418,300 pounds.

To date, only spiny lobsters have been exploited. Local fishermen seldom venture beyond the coast's shallow waters, which are protected by the world's second longest barrier reef. Marine scientists believe, however, that other species--shrimp, for example--are potential commercial fisheries.

Deep-sea fishing seems promising but, so far, lack of research data, economic fishing methods, and developed overseas markets have prevented exploitation of these fishes. (U. S. Embassy, Belize City, Nov. 30, 1966.)



Chile

FISH MEAL AND OIL PRODUCTION UP FIRST 8 MONTHS 1966

Production of fish meal during January-August 1966 was 169,200 metric tons, markedly above 1965's 93,100 tons and nearly equal to 1964's record 174,700 tons. Fish oil production during the same period reached 16,600 tons, sharply above the 10,400 tons produced in 1965 and near the 17,600 tons of 1964. The increase reflects a larger catch following the anchovy's return in December 1965. Although prices were lower than 1965, export earnings for fish oil and meal in 1966 were expected to be substantially above 1965.

In 1965, exports of fish meal and oil totaled 66,935 tons and 7,942 tons, respectively--sharply below the 146,450 and 13,710 tons exported in 1964. This decline resulted from a marked reduction in catch because of the anchovy shortage. The most general explanation of the shortage was higher water temperatures due to a warm current.

Because of the anchovy shortage, the Government prohibited, on March 4, 1966, the "extraction, sale, purchase, transport and possession" of anchovy less than 12 centimeters long. It allowed, however, a 20-percent tolerance in the catch. (U. S. Department of Agriculture, Nov. 7, 1966.)



Venezuela

SHRIMP INDUSTRY FALTERS

The expanding shrimp processing industry of the Maracaibo area was shaken by very poor fishing in 1966. The white shrimp (*Penaeus schmitti*), principal species in commercial production, was in short supply.

Venezuela (Contd.):

Landings of trawlers working in the Gulf through July were a third of the 1965 take; the catch of fishermen on Lake Maracaibo was no more than a fourth of record production. Catches failed to cover trip costs of the trawlers through July. Fishing improved in August and held at break-even level or better through October.

The price of shrimp increased steadily as plants competed for the small supply. The retail price in Caracas climbed to 8 Bolívars a kilogram, heads-on (US\$0.82 a pound).

Principal processing plants remained open through 1966, but production was small. In early November 1966, several were processing sea bobs. Several marginal plants closed but may be expected to reopen when shrimp are plentiful again. The impact was most severe on the thousands of coastal families of the Maracaibo area whose livelihood depends on the industry.

Plant operators are optimistic that the scarcity of white shrimp is a cyclic phenomenon experienced by other countries. Several plants are proceeding with plans to establish their own trawler fleet. Thirteen vessels joined the Punto Fijo trawler fleet since January 1966. Technicians feel confident that the disappearance of the whites was not due to overfishing, though 1965 was a record year. The tagging program designed to establish the migration pattern of the Lake shrimp is underway.

Government Acts

The Government, recognizing the hardship to coastal area fishing families, has moved to coordinate better its field activities. A new Fisheries Office (Oficina Nacional de Pesca) is being organized in the Ministry of Agriculture. It will take over all activities concerned with exploitation and conservation of marine resources.

The Ministry has agreed to modify the fishing zones of the Gulf of Venezuela. The off-limits line stretching from Punto Fijo to Boca Paijana is to be moved back to Punto Fijo-Puerto Gutierrez; this will increase the trawling area, particularly off the mouth of Lake Maracaibo. Trawlers will continue to be barred from fishing within 8 miles of the coastline, but the Government is permit-

ting small trawlers, up to 15 meters, to work the area between 4 to 8 miles of the coastline. The first 4 miles from shoreline will continue to be reserved for net fishermen. The trawler fishermen long have contended that the off-limit line forced trawlers too far out for effective fishing or even safe navigation (most boats do not have communication equipment). (U. S. Embassy, Caracas, Nov. 9, 1966.)



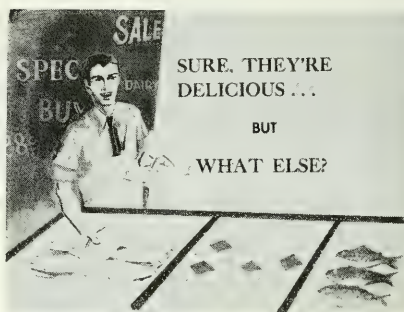
MID EAST

Israel

MULLET SPAWNED IN CAPTIVITY

An Israeli scientist under contract to BCF, through the Foreign Currency Research Program, has succeeded in spawning grey mullet in captivity and now is rearing the fry in aquaria. This important discovery may stimulate the culture of mullet in estuarine areas.

Biologists in the Middle and Far East had been trying for years to induce the grey mullet to spawn in captivity.



EUROPE

USSR

MOTHERSHIP WHALING OFF JAPAN DISTURBS INDUSTRY

The extension of Soviet mothership-type whaling operations to the northeastern coast of Japan is disturbing to the Japanese whaling industry because it may have an adverse effect on Japan's land-based whale fishery.

The Soviet fleet (one 20,000-ton class mothership and two catcher vessels) was reported November 23, 1966, near 39°20' N. latitude and 144°16' E. longitude (about 127 nautical miles off northeast Japan). This is an area where mothership-type whaling operations are prohibited under Japanese domestic laws to protect the resource. There is growing belief that the Japanese coastal whale fishery operators should persuade the Japanese Government to permit a shift from land-based to mothership-type operations--particularly since land-based operations over the past several years have become less manageable as distance from base to whaling grounds lengthened. ("Suisan Keizai Shimbun," Dec. 1, 1966.)

FISHES OFF MEXICO

Two large stern factory trawlers left the Soviet Far East in mid-November 1966 for the fishing grounds off Mexico's Baja California. Three more vessels were expected to follow. The Soviets were expected to fish for anchovy, sardine, bluefin tuna, and mackerel. A Soviet exploratory fishing fleet during October 1965-March 1966 assessed the abundance of those species and found commercial fishing feasible.

ORGANIZES BERING SEA FISHING EXPEDITION

The Kamchatka Fisheries Administration was preparing to begin flounder fishing in Bristol Bay in mid-December 1966. The Sakhalin Fisheries Administration was getting ready to start herring fishing off the Pribilof Islands. It had dispatched an ex-

ploratory vessel (SRTM-417) to determine the best herring areas. Soviet flounder and herring fisheries in the eastern Bering Sea have been traditional since 1958-1959.

KINDS AND VALUE OF EXPORTS TO U. S. CHANGE

During first-half 1966, the Soviet Union exported to the U. S. 414 metric tons of fishery products worth \$459,000. Frozen shrimp and spiny lobster exports led with 355 metric tons (\$338,000) and 43 metric tons (\$70,000), respectively (table).

Type of Product	Quantity Metric Tons	Value US\$
<u>Fresh, frozen, etc.:</u>		
Shrimp, frozen, shell-on . . .	355.1	337,926
Sturgeon roe	2.0	20,110
Spiny lobster tails	5.1	17,952
Lobsters ^{1/}	43.0	70,426
Total fresh, frozen, etc. . .	405.2	446,414
<u>Canned:</u>		
Fish ^{2/}	4.6	5,757
Fish in oil	1.2	1,541
King crab meat	2.8	4,990
Total canned	8.6	12,288
Grand total	413.8	458,702
^{1/} Not otherwise specified, but probably also spiny lobster.		
^{2/} Not otherwise specified.		

Comparing January-June 1966 with 1965, two trends become apparent: (1) the value of 1966 U. S. imports from the USSR for the first 6 months was already 90 percent of the total value for 1965 (\$505,000); (2) the composition of imports had changed completely--shrimp, whose value in 1965 was only about \$10,000, in 1966 made up two-thirds of the value of all fishery imports. Scallops and cod blocks were not imported in 1966, and traditional canned king crab meat imports were low (\$5,000 in first-half 1966, compared to \$52,800 for all of 1965.)

NEW FISHERY PRODUCTS PLANNED

The Far Eastern fisheries export firm DALMOREPRODUKT will produce new specialized fishery products for domestic and

USSR (Contd.):

foreign markets this year. This decision was made after much planning and investment in technological research and manufacturing equipment. Among the new products: canned oysters; smoked mussels in oil packed in glass jars; canned squid in small containers; octopus in tomato sauce in small cans; canned trepang; cooked dried trepang in small plastic containers; canned shrimp; canned roe of sea urchins; medicinal preparations made of sea kale in small glass jars, and other products.

Many of the new products will be exported to Japan. Most seaweeds will be used in domestic agar-agar plants the Soviets are constructing.

The export firm also is sponsoring research conducted by the Pacific Fisheries Institute for Fisheries and Oceanography (TINRO). TINRO and the firm are administratively controlled by the state-owned Main Administration of Far Eastern Fisheries. In August 1966, this research centered on abalone resources near Sakhalin Island; in November 1966, on squid in the Gulf of Tartary between mainland USSR and Sakhalin. Research on seaweed resources was conducted throughout 1966.

* * *

DISCOVERS NEW SHRIMP RESOURCES

The research vessel "Kalmar" returned to Vladivostok from a 4-month exploratory trip in the northwestern Bering Sea where it discovered extensive shrimp resources in the Gulf of Anadyr. This is said to be one of the most significant discoveries by Soviet fishery scientists in recent years. Officials of the Far Eastern Fisheries Administration plan to send a shrimp fleet this year to explore the resource.

Another shrimp area was reportedly discovered by the research vessel "Osadkovo" off Northwest Africa. The Osadkovo left Kaliningrad in March 1966 with a party of 5 scientists of the ATLANTNIRO (Atlantic Scientific Research Institute for Marine Fisheries and Oceanography). Most of the research

was done in the Gulf of Guinea and in the Bight of Biafra (off Cameroon). The vessel returned in late August 1966.

* * *

RAIL MOVE AIDS KING CRAB TRANSPLANT PROGRAM

Soviet biologists have attempted to transplant Kamchatkan king crab (*Paralithodes camtschatica*) ever since 1930. They gave up in 1935. In 1960, they tried again and J. A. Misharev succeeded in bringing to Moscow alive, by air, 22 adult male crabs.

Soon, a research program was begun by several VNIRO (All-Union Scientific Fisheries Research Institute for Fisheries and Oceanography) laboratories to develop methods that would insure mass transplantation of king crab eggs, larvae, or adults. During October 1960-April 1961, over 8.2 million crab eggs were shipped overland from Vladivostok to Murmansk; only 1.5 million survived. In August 1961, almost 10,000 young crabs (under 1 year) were shipped; the survival rate is not known. Both attempts were not too successful.

A third attempt was made by air.

King crab specimens were collected at Petropavlovsk-Kamchatskii Laboratories from a local fishing Kolkhoz and transported to the Murmansk Marine Biological Station. The main Administration for Protection and Reproduction of Fishery Resources (Glavyrbvod) was the principal Soviet agency concerned with the transport and acclimatization of crabs. Also participating in the studies of transplant results were VNIRO Laboratories in Moscow, PINRO in Murmansk and in Kamchatka, TINRO.

Barents Sea Offers Vast Potential

Air transport was costly and had adverse effect on survival rate. Glavyrbvod began to look for other transportation means and settled for the old-fashioned Transsiberian Railroad. In November 1966, a specially equipped railroad car carried about 350 adult king crabs on the 10,000-mile journey from the Pacific to the Barents Sea. The crabs arrived in good condition.

USSR (Contd.):

The Soviets have great interest in the success of these experiments. In 1962, a VNIRO scientist (Iurii I. Orlov) calculated that the potential area of acclimatization of the Kamchatkan crab in the Barents Sea might be 4 times as large as is its present habitat along the Kamchatkan coast. Canned king crab exports are about one-fifth the value of all fishery exports; in 1965, they totaled 10.5 million rubles (\$11.5 million), three times the caviar exports.

* * *

HOLDS CONFERENCE ON MARINE MAMMALS

Representatives of fishery research institutes, the fishing industry, and conservation groups participated in the third All-Union Conference on Marine Mammals held in Vladivostok, November 1966. The conference was opened by the Director of Scientific Research of the USSR Ministry of Fisheries, I.P. Zaitsev.

The participants made the following recommendations: (1) Hunting for Pacific whales, walruses, and certain types of seals should be reduced because of diminishing stocks. (2) The potential of Antarctic seal resources should be studied (the Weddel Sea seals and the crab-eating seals in the Antarctic alone number 8 million to 9 million, according to Soviet scientists).

* * *

METEOROLOGISTS TO HELP FISHERMEN

Weather forecasting centers have been set up on all Soviet factoryships in the Murmansk fishing fleet (Soviet Northern Fisheries Administration). These centers, called "navigational and despatch bases," help fishing vessels avoid stormy areas and find calm seas.

At the time U. S. and USSR fishery officers were exchanged in the Northwest Atlantic--during the 1965 International Commission for the Northwest Atlantic Fisheries--only the factory flagship, with the Commander of the Fleet aboard, had meteorologists. They received their weather data from both Moscow and Washington weather stations. In addition, there was a rudimentary weather reporting

system from fishing vessels to flagship. Apparently this system now has been perfected--probably to cut down time lost by fishing vessels in bad weather.

The introduction of forecasting aboard the Murmansk fishing vessels is not unusual. Almost all advances and innovations are first tried in the Northern Fisheries Administration, the oldest and best organized of the 5 major Soviet Fisheries Administrations; eventually, improvements spread south and east.

* * *

CONDUCTS EXTENSIVE PACIFIC FISHERY RESEARCH

The fishery research vessel "Birokan" (SRT 4454) carried out a scientific expedition in the Bering Sea and waters off Aleutian Islands from December 1965-mid-October 1966. Its scientists studied the distribution and seasonal concentrations of Alaskan king crab on the Continental Shelf of the eastern Bering Sea and off Unimak Pass. During a previous cruise, October 1964-July 1965, the Birokan explored fishery and whale resources in the Eastern Pacific between Hawaii and Mexico. It discovered large schools of Pacific mackerel and sardines off Mexico.

In early November 1966, the research vessel "Lira" departed her Siberian home port for an extensive cruise off the Aleutian Islands to determine ocean perch stocks. The Soviet fleet has fished heavily for them in that area for several years; in 1965, 64,500 metric tons were caught.

The "Algama," a fishery research vessel of the Sakhalin Scientific Research Institute for Fisheries and Oceanography, returned to Iuzhno-Sakhalinsk in early December 1966 from a nearly year-long research cruise. The vessel discovered concentrations of commercial species in Tatarskii Strait, Sea of Japan, and on the wide Continental Shelf between the Sakhalin and Kuril Islands.

In late March 1966, commercial concentrations of walleyed pollock were discovered off the southwestern part of Sakhalin; for a short time, the Algama and the exploratory vessel of the Sakhalin Fisheries Administration cooperated in notifying Soviet commercial vessels of the new resource. In April, schools of "redfish" were discovered along

USSR (Contd.):

the Siberian coast, but not in commercial concentrations. By May, flounder concentrations were encountered between Cape Nelma and Cape Zolotoi below the Siberian City of Sovetskaya Gavan. Exploratory hauls yielded 3 to 4 metric tons of fish each. Other new resources found in the northwestern Sea of Japan off the Soviet Mainland were crabs, ling cod, and walleyed pollock; between Sakhalin and the southern Kurils, important concentrations of Pacific ocean perch were discovered.

In mid-December 1966, the fishery research vessel "Kalmar" departed for the same general areas to confirm Algama's findings and conduct more thorough research.

Early in December 1966, a new exploratory and fishery research vessel, the medium freezer trawler SRTM-8437, arrived at Nevelsk on Sakhalin Island. The vessel was constructed at Volgograd (formerly Stalingrad) Shipyards for the Sakhalin Fisheries Administration.



Norway

BUILDS SEVERAL LONG-RANGE FISHING VESSELS

Although Norwegian interest in purse seiners is at peak, considerable demand exists for distant-water freezer trawlers and long-liners.

A 265-ft. factory stern trawler for a Norwegian owner has been ordered from a Trondheim shipyard. It is scheduled to be delivered in September 1967. A shipyard at Aalesund is building a 217-ft. factory stern trawler scheduled for early 1967 delivery. Gross tonnage will be about 1,300 and main engine 2,140 horsepower. Planned for delivery in February 1967 is the 175-ft. freezer trawler "Ole Wirum" equipped with vertical plate freezers, giving 19- to 20-ton daily freezing capacity. A special plant is being built in Kristiansand to thaw and further process the catch of the Ole Wirum which will be frozen in large blocks.

The current trend in long-lining is for vessels operating year-round off Greenland

and for shark fishing in Atlantic waters. The vessels are combined "salters" and freezers. Many are converted whalers with shelter decks so that all fishing and processing operations take place under cover.

Long Liners Becoming Larger

Like purse seine owners, long-line owners are investing in bigger vessels. Conversion of several 158-ft. whalers was a big step forward. Now a 170-ft. vessel, formerly the "Star VI," built in 1948, has been rebuilt and renamed "Leiv Aarset". It is equipped with vertical plate freezers and a refrigerated hold for about 100 tons of frozen fillets or block-frozen mink fodder. The main emphasis will be on salted fish; 450-500 tons can be stored. The Leiv Aarset began operating off Greenland.

Joining the long-line fleet in February 1967 is the first vessel to be designed exclusively for Greenland fishing in several years and the biggest designed for long-lining. It costs about £150,000 (US\$420,000), has a main engine of 1,000 horsepower, and 2 continuous decks. Its main dimensions: length overall 160 ft.; breadth 29 ft.; depth to main deck 15 ft., and to shelter deck 22 ft. All accommodations are aft on the starboard side with access from a passageway of the port side. The long-line will be hauled from the main deck. The vessel's main task will be salting, but vertical plate freezers are fitted to handle small cod, haddock, ocean perch, and catfish. Total capacity of the holds is 21,500 cubic feet: about 75 percent is for salt fish, the remainder for frozen fillets.

Most long-line vessels do not have splitting or filleting machines. Mainly this is because the catch is brought aboard more slowly than in bottom trawling. However, owners are now considering installation of processing machinery with the eventual aim of having cutting crews. ("World Fishing," Nov. 1966, and "Dansk Fiskeritidene," Nov. 25, 1966.)

* * *

EXPORTS OF MOST FISHERY PRODUCTS UP IN FIRST 9 MONTHS OF 1966

In January-September 1966, Norwegian exports were up for frozen fillets, frozen herring, fish meal, and herring oil, while total shipments of canned fish were about the same as in the same period of 1965.

Norway (Contd.):

Frozen Fillets: U. S. imports of frozen fish fillets and blocks were over 5,200 metric tons (a gain of 16 percent), according to the U. S. Bureau of the Customs. European countries, however, continued to be the leading markets for Norwegian frozen fillets.

Canned Fish: "The Norwegian Cannery Export Journal," October 1966, summarized the canning situation:

Following an above-average brisling fishing season, Norwegian exports of canned brisling were at a record level in the first 9 months of 1966. Larger shipments to England offset a decline in exports to the U. S. The Norwegian factories froze a quantity of brisling for canning after the October 15 close of the brisling fishing season. This reserve, combined with stocks on hand, were expected to provide adequate supplies to satisfy export demand.

Sild and Shellfish Exports Down, Herring Oil Up

The decline in small sild exports was due partly to a shortage of supplies earlier in 1966. Heavy canning of small sild in the fall raised stocks to about 250,000 standard cases in late September 1966.

Shellfish exports were down due to sharp drop in shipments of canned shrimp.

Fish Meal and Oil: The U. S. became a significant buyer of Norwegian fish meal for the first time in recent years with imports in January-September 1966 of 13,700 metric tons (U. S. Bureau of Customs data). However, the leading market continues to be the United Kingdom.

The sharp rise in exports of crude herring oil reflects the increased output of the reduction plants. With record herring catches, 1966 production of 200,000 tons of fish oil and 400,000 tons of fish meal were forecast. ("Fiskets Gang," Oct. 27 and 28, 1966.)

* * *

GOOD MARKET FOR FISH MEAL AND OIL IN DECEMBER 1966 REPORTED

Most of Norway's fish meal and oil has been sold, reported Norsildmel, the centralized sales organization for the fish reduction plants. The record stocks of fish meal (230,000 metric tons) and oil (120,000 tons) at the beginning of November 1966 will have been shipped to customers at home and abroad before the end of March 1967. Substantial future sales of the 1967 production of fish meal also have been concluded.

The Norwegian ban on fishing for the meal and oil industry was lifted at the end of 1966. (U. S. Embassy, Oslo, Dec. 11, 1966.)

* * * *

FIRM TO MAKE HIGH-PROTEIN FISH MEAL

A Norwegian plant is scheduled to start producing high-protein herring meal in May 1967. Its annual output will be 12,000 metric tons. The producers claim their product will contain less than 1 percent fat and 80-83 percent protein, compared to 70-75 in regular herring meal.

Petroleum solvents will be used to draw the fat out of the meal, but none of them will remain in the finished product. The estimated price will be higher than the price for regular meal. It is claimed, too, that the high-protein meal will be a good mink food--and that it can be fed to pigs right up to the day they go to the slaughterhouse, without affecting the taste of pork. (Export Council of Norway, Dec. 1966.)

* * * *

Norwegian Exports of Selected Fishery Products, January-September 1965-1966		
Product	Jan. -Sept.	
	1966	1965
	... (Metric Tons) ...	
Frozen fillets:		
Haddock	10,912	7,336
Cod	20,792	20,371
Coalfish	13,512	14,509
Herring	8,207	3,252
Other	4,674	6,447
Total frozen fillets	58,097	51,915
Frozen herring	13,552	9,932
Canned fishery products:		
Brisling	5,619	4,947
Small sild sardines	8,784	9,833
Kippers	2,429	2,560
Shellfish	568	922
Other	3,452	2,871
Total canned fish	20,852	21,133
Fish meal	183,121	170,279
Herring oil, crude	49,195	3,611

Norway (Contd.):

FISH MEAL AND OIL SUPPLIES WERE HIGH IN FIRST 10 MONTHS OF 1966

Due to heavy production of fish meal and oil in the first 10 months of 1966, Norway banned industrial fishing from November 5 to December 31, 1966. The ban reflected the oversupply in the international fish meal market. Norwegian stocks of herring meal in early November 1966 were 200,000 metric tons, about twice November 1965 stocks.

Record catches resulted from exceptionally rich occurrences of herring, favorable fishing conditions, and a purse-seine fleet almost trebled in catching capacity during 1966. Total deliveries to fish reduction plants for first 10 months exceeded 20 million hectoliters, compared with about 16 million hectoliters for all of 1965. Official estimates of 1966 fish meal production were about 400,000 metric tons (309,000 tons in 1965). Production of fish oil was expected to exceed 200,000 tons (167,000 tons in 1965).

Exvessel Prices Were High

Despite declining export prices for herring meal, exvessel prices in Norway were maintained at very high levels during 1966. This was made possible by transfers of more than 100 million kroner (US\$14 million) from the Herring Price Regulation Fund (Slidefondet). The Fund stood at 138 million kroner (\$19 million) prior to the first price reduction in summer 1966 for fish delivered to reduction plants.

The ban on fishing for the fish meal and oil industry was widely accepted in fishing circles as necessary to bridge the gap between production and sales of fish meal. (U. S. Embassy, Oslo, Nov. 13, 1966.)

Note: One hectoliter equals 220.46 lbs. or 26.4 gals.



Iceland

EXPORTS OF FISH MEAL AND OIL WERE UP, FILLETS AND STOCKFISH DOWN

During January-July 1966, Iceland's exports of fish meal and oil increased sharply over the 1965 period, according to the periodical "Hagtidindi," August 1966. But ex-

Exports of Selected Fishery Products, January-July 1965-1966						
Product	Jan.-July 1965			Jan.-July 1966		
	Qty.	Value f.o.b.		Qty.	Value f.o.b.	
	Metric Tons	1,000 Kr.	US\$ 1,000	Metric Tons	1,000 Kr.	US\$ 1,000
Salted herring	12,129	150,481	3,495	10,546	114,232	2,653
Other salted fish	24,001	460,264	10,689	26,133	442,490	10,276
Stockfish	3,006	95,403	2,216	6,216	180,448	4,191
Herring, frozen	13,444	87,061	2,022	15,803	100,271	2,329
Fish fillets, frozen	23,638	624,727	14,508	29,895	660,939	15,808
Shrimp & lobster, frozen . .	659	84,498	1,962	311	37,249	865
Fish and whale oil	54,734	438,361	10,180	43,554	368,074	8,548
Fish meal	81,284	616,930	14,327	64,806	450,056	10,452

Note: Values converted at rate of 1 krona equal 2.32 U. S. cents.

ports of frozen fish fillets and stockfish decreased in the first 7 months of 1966.



Denmark

MODERN PURSE-SEINE VESSEL ACQUIRED

The "Caroline Musholm," the first Danish fishing vessel specifically designed to use modern purse-seine gear, was scheduled to be completed in Norway in mid-December 1966. The vessel will carry a 12- to 15-man crew and work the Greenland and Faroese fisheries. Displacing 450 tons, it is nearly 43 meters (141 feet) long, and is propelled by an 800-horsepower engine. It is the first Danish fishing vessel to employ side-thrust propellers fore and aft. Its fish pump can empty a 300-ton catch within an hour. ("Vestkysten," Dec. 9, 1966.)



Greenland

FISHERIES PROCESSING PLANT IS BEING BUILT

A private company is constructing a processing plant at Jacobshavn. The plant will cost about 1.5 million Danish kroner (US\$217,000) and process shrimp, salmon, and halibut. The primary emphasis will be on freezing shrimp. The plant will employ 60-70 persons when it begins operations after October 1967. ("Berlingske Tidende," Dec. 12, 1966.)



France

PLANS TO ASSIST FISHING INDUSTRY

Programs authorized in 1967 to subsidize construction and modernization of fishing vessels will go from 3.5 million to 8.7 million francs (US\$707,000 to \$1,757,400). For other aid and supports, 2.9 million will be increased to 7.12 million francs (US\$385,800 to \$1,438,200). The aid will be directed towards research and training activities, investment, and market organization.

The Government is asking industry to make a special effort to finance developments that will spur the organization of markets. Consolidation of firms is encouraged to meet competition from other European Economic Community (EEC) countries. Those unable to consolidate or too small to compete will be assisted to leave the industry.

Funds for Laboratories and Fleet

The funds allotted for the Fisheries Institute will complete the laboratories at Sete and La Trinite-sur-Mer, and construction of one at Nantes. The operating funds permit recruitment of technicians. Two training vessels will be built and the training schools fully equipped. Greater efforts will be made in social welfare.

To modernize fleet, the Government plans to increase aid to fishing and vessel industries. Probably, assistance will be based on vessel size. The larger ones, capable of remaining or becoming competitive in the EEC, will receive subsidies up to 15 percent. Also, they will benefit from long-term credits and tax reduction. But Government aid will not extend beyond 1967. For small craft fishing, aid will augment loan facilities. The small-scale fishermen will benefit from relocation plan funds. ("Maree de France," Dec. 1966.)

TUNA LANDINGS WERE 10% OF FISH PRODUCTION

The French tuna fishery produced about 42,000 metric tons of tuna in 1965. This accounted for 10 percent of France's total fish production and 14 percent of the marine fish production. ("Revue Generale du Froid," August 1966.)



German Federal Republic

IMPORTS 80% OF CANNED TUNA IN OIL FROM JAPAN

West Germany buys from Japan about 80 percent of her imports of canned tuna in oil. In 1965, she imported 14,271 metric tons: 11,550 tons from Japan, 1,816 tons from Yugoslavia, and 597 tons from Peru, and the remainder from another source.

Imports during first-half 1966 were 5,777 tons: 4,331 tons from Japan, 967 tons from Peru, and 318 tons from Yugoslavia, and the remainder from another source. The sharp decline from Yugoslavia was attributed to that country's almost complete suspension of production due to rising costs of frozen tuna from Japan. At over US\$500 a metric ton, they made profitable operations impossible. ("Kansume Nippo," Nov. 15, 1966.)



Italy

FROZEN TUNA IMPORT QUOTA INCREASED 5,000 TONS

According to the Japanese Embassy in Rome, the European Common Market agreed to let Italy increase the quantity of frozen tuna she could import from nonmember countries under the lower tariff of 0.5-percent ad valorem from 40,000 to 45,000 metric tons for the current fiscal year.

Italy had requested a 10,000-ton-quota increase because Common Market nations could not supply adequately growing domestic demand. ("Suisancho Nippo," Dec. 26, 1966.)



United Kingdom

FISHERY LOAN INTEREST RATES ANNOUNCED

The British White Fish Authority announced that its rates of interest on loans made from October 22, 1966, would be:

Fishing vessels, new engines, nets, and gear: on loans for not more than 5 years $7\frac{1}{2}$ percent, decrease $\frac{1}{8}$ percent; on loans for more than 5 years but not more than 10 years $7\frac{1}{2}$ percent, decrease $\frac{1}{4}$ percent; on loans for

United Kingdom (Contd.):

more than 10 years but not more than 15 years $7\frac{3}{8}$ percent, decrease $\frac{3}{8}$ percent; on loans for more than 15 years but not more than 20 years $7\frac{1}{4}$ percent, decrease $\frac{1}{8}$ percent.

The rates for loans to processing plants--for not over 20 years--remain unchanged at $7\frac{1}{4}$ percent. ("Fish Trades Gazette," Nov. 5, 1966.)



Greece

LANDINGS ROSE IN FIRST 9 MONTHS OF 1966

The Atlantic freezer trawler fleet landed 22,547 metric tons of frozen fish in the first 9 months of 1966, compared to 18,818 tons in the same period of 1965. The increase was partly due to unusually heavy arrivals in September 1966, which raised stocks of frozen fish in Greece to about 7,000 tons. Wholesale frozen fish prices showed some decline in September; they stabilized at about 9 to 10 drachmas a kilo (13.7 to 15 U. S. cents a pound).

Greek trawlers have been moving farther south along the African coast because of declining catches off more northern areas of Africa. The area around 10° N. latitude has become an important fishing ground for Greek trawlers. Two trawlers reported plans to transship catches either from Las Palmas or directly from transport vessels on fishing grounds.

Several are fishing for shrimp in the Persian Gulf. ("Aliela," Oct. 1966.)



Romania

FISHES OFF AFRICA

The Romanian freezer stern trawler "Galati" left home port for her 6th fishing trip to the Cape Verde Plateau off Africa's northwestern coasts (between the Canary Islands and Dakar). Previously, the Galati fished on Georges Bank in the Northwest Atlantic.

A second stern trawler, the "Constanta," will join the Galati in the African fishing grounds after its overhauling in a Rotterdam shipyard is completed.



Bulgaria

HAS AMBITIOUS 5-YEAR PLAN

The Bulgarian 5-Year Plan (1966-1970) provides a 500-percent increase over the 1965 fish landings of 17,300 metric tons. Most of the 87,000 tons planned to be landed in 1970 will come from Bulgarian high-seas operations, conducted mainly in the Atlantic off South-West Africa. Bulgaria has 4 or 5 large stern trawlers (3,200 gross tons each), but the USSR is committed to sell her 20 such trawlers by 1970. ("Rabotnicheskoe Dele," Nov. 27, 1966.)



Poland

WILL PRODUCE FISH PROTEIN CONCENTRATE

The scientists of the Polish Sea Fisheries Institute, Swinowjsle Branch, have produced several kilograms of odorless and tasteless fish protein concentrate. Commercial production on a small scale is expected to begin this year. ("Polish Maritime News, No. 97, Sept. 1966.)

* * *

FIRST FISHERY FACTORY-MOTHERSHIP SAILS FOR NORTH ATLANTIC

The M/S "Gryf Pomorski" (Pomeranian Griffin) sailed in January from Szczecin for the Atlantic fishing grounds between Labrador and Georges Bank. Its launching introduced the "factory-mothership" concept to the Polish deep-sea fishing fleet. It represents a significant advance for the deep-sea fishing industry. While Polish vessels are not newcomers to the northwest Atlantic fishing grounds, only in recent years has the area assumed real importance. In 1960, for example, Poland had only one factory trawler in the northwest Atlantic; annual catches were under 3,000 metric tons. By

Poland (Contd.):

1965, the catches had increased to 56,000 tons.

The vessel was built at the Gdansk shipyards for the Dalekomorskie Bazy Rybackie (Oversea's Fishing Bases) of Szczecin. It has these features: shelterdeck; gross weight of 13,000 tons and dead weight of 9,200 tons; length: 165.5 meters (542 feet), breadth: 21.3 meters (70 feet); speed: about 15 knots; and her 5 holds have total capacity of 10,130 cubic meters (357,690 cubic feet). Four holds are immediately refrigerated to -25 degrees C. (-13° F.) at an external temperature of +30° C. (80° F.). The fifth hold will be used for storage of fish meal; the ship will produce daily 20 metric tons of meal, 20 tons of ice, and 48 tons of water.

9 Trawlers Accompany Her

Gryf Pomorski is accompanied by 9 trawlers able to unload 150-200 tons of fish every 24 hours. When it returns to port in early March, it will carry about 4,800 tons of frozen fish, 800 tons of fish meal, and 200 tons of oil. Of the 257-person crew, 136 are producing the products listed. Present plans call for four or five 75-day trips a year.

In addition processing and storage functions, Gryf Pomorski will provide social and cultural amenities for her own and the trawler crews. It is fitted with movie hall, reading room, hospital, laundry, and barber shop.

The Gdansk shipyard will complete in late 1967 a second ship of this type. A third is due before the end of 1970.



Czechoslovakia

TO IMPORT BRITISH FROZEN FISH

State-owned import firms have contracted to buy US\$840,000 worth of frozen fish a year from the British frozen seafood consortium. The fish will be shipped from the fishing ports of Grimsby and Hull via Hamburg. ("Fishing News," Dec. 9, 1966.)



Ireland

EXTENDS FISHERIES ZONE TO 12 MILES

The law extending Ireland's fishery limits from 6 to 12 nautical miles has become effective. The Irish will recognize traditional West European fisheries (France, Belgium, Netherlands, Spain, and West Germany) in the outer 6-mile zone, but those nations will not be allowed to open up new fishing areas or change the traditional type of fishing.

Other countries that used to fish within the 12-mile zone, including the Soviet Union and Poland, will be barred there in the future. ("New York Times," Jan. 5, 1967.)

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BCF EXPERTS TO AID IRISH FISHERIES

John B. Glude, Deputy Regional Director of BCF's Seattle office, and John Peters, fisheries technologist of BCF's Gloucester (Mass.) laboratory, left for Dublin in mid-February to assist the Irish Government in setting up a program to improve the fishing industry.

They will help Irish officials implement recommendations of the U. S. survey team in a 1964 report on Ireland's fishing problems. Glude, a leader of that team, said the study followed a request by the then Irish Prime Minister, Sean Lemass, to the late President Kennedy.

According to Glude, the Irish Government is particularly interested in a three-phase program: Improvement of boats and gear; Development of shellfish resources, such as oysters, mussels, clams and lobsters; and Fish quality control, which involves improvements in care and handling of fish after they are caught.

"Ireland's fishing industry is relatively small, but the potential is there for a sizeable increase," Glude stated. Ireland exports some fish, especially to England and France, and there is considerable opportunity to expand both domestic consumption and the export business. Glude noted that Ireland has much to learn about proper care of fresh-caught fish.

"For example, it is common practice not to ice fish after they are caught because many Irish consumers believe that fish must not be fresh if it has to be placed on ice," he said.

Glude and Peters expect to be in Ireland 4-6 months. The Irish Government is paying their expenses.



ASIA

Japan

CURBS PORT CALLS BY FOREIGN VESSELS

Starting December 12, 1966, Japan began to implement a new ordinance affecting foreign fishing off her coast and fish landings in her ports:

- **Prohibition of Fishing:** Foreign nationals and corporations are not permitted to fish within territorial waters. Japan presently adheres to 3-mile territorial sea limit.

- **Restrictions on Fish Landings:** Foreign nationals are not permitted to land their catches or processed fishery products in Japan--except: (1) shipments from foreign countries accompanied by certificates of shipment; (2) catches of Japanese fishing vessels landed legally by foreign residents in Japan; (3) imports authorized under Import Trade Control Ordinance; and (4) fish landings approved by the Minister of Agriculture and Forestry.

- **Halt Orders to Vessels:** The Minister of Agriculture and Forestry is authorized to issue halt orders to vessels observed violating provisions of this ordinance.

The ordinance also contains penalties: Maximum of two years in prison, fine not exceeding 50,000 yen (US\$139), and confiscation of vessel and fishing gear. ("Suisan Keizai Shimbun", Dec. 7, 1966.)

* * *

HAS \$6.4 MILLION OVERSEAS FISHERY INVESTMENTS

Japanese capital in overseas fishery ventures, as of October 1, 1966, totaled about US\$6.4 million--0.8 percent of total Japanese investments abroad--invested in 32 corporations in 28 countries. This was disclosed in late 1966 by the Japanese Fisheries Agency in its report: "Present State of Investments in Overseas Cooperative Fishery Ventures."

Investments in Central and South America (10 countries) led with \$2.85 million in 11 companies, followed by southeast Asia (9 countries) with \$1.77 million in 11 companies,

Africa (4 countries) with \$344,000 in 4 companies, and Near East, Europe, and North America (5 countries) with \$1.4 million in 6 companies. Japan's average capital outlay of \$200,000 per invested company represents an investment ratio of over 50 percent to the average paid-up capital of about \$361,000 per company.

Of the 32 corporations, 8 are engaged in land-based cold storage operations (they lead all others in value of investment); 10 in bottom trawling; 8 in tuna fishing; and one in whaling. Those firms operate 86 vessels: 58 trawlers, 17 tuna vessels, 6 whaling vessels, and 5 "other."

Overall Landings Trending Downward

Fish production by the joint companies (based on reports from 11) in 1965 totaled 22,000 metric tons: 14,300 tons of bottom-fish; 5,500 tons of tuna and tunalike fish; and 2,200 tons of shrimp. About 1,000 whales were landed. While shrimp and whale production have gradually increased, overall fish landings have been trending downward since 1964 due to the leveling off of the trawl catches and a decline in tuna production.

Japanese employees assigned to overseas companies number slightly over 600, about 20 percent of the estimated 3,000 employed by those firms. Of the 25 companies reporting on their 1965 business conditions, 7 showed profits, 11 losses, and 7 were either not yet operating, idle, or in unknown financial position. ("Suisan Keizai Shimbun," Dec. 12, 1966, and other sources.)

* * *

GRANTS \$9 MILLION TO S. KOREA FOR FISHERIES DEVELOPMENT

In December 1966, Japan and S. Korea agreed that Japanese grants to S. Korea will include US\$2,615,000 to promote fishing and \$6,473,500 to introduce, construct, or remodel fishing vessels--a total of \$9,088,500. This is the second series of grants under the Japan-South Korean Fisheries Cooperative Program. The first series totaled \$13,530,000. No money can be spent for vessels or facilities to be used in the North Pacific salmon fisheries.

Japan (Contd.):

The grants are part of Category 1 of the Japan-Korean Settlement Agreement. Under the grant program, \$40 million is for fisheries. To date, \$22,618,500 has been allocated--about half. ("Suisan Tsushin," Dec. 1, 1966.)

* * *

PROFITS RISE FOR MEDIUM AND SMALL FISHERY FIRMS

A summary of the latest economic report of the Ministry of Agriculture and Forestry's Statistics and Survey Division appeared recently in a periodical. Titled "Economics of Medium and Small Fishery Establishments for 1965," it points out:

(1) The gross receipts of small and medium fishery enterprises increased for all sizes of vessels. They were especially marked for the 50- to 100-, 100- to 200-, and 200- to 500-ton vessels.

(2) Expenses also increased for all sizes, but the rate of increase for gross receipts exceeded the increase in expenses. So, there was more profit.

(3) The greatest cost increase was for labor. This report is in line with others expressing industry concern over the increasing cost of labor.

Depreciation increased slightly for the 30- to 50- and 50- to 100-ton categories and decreased in the others. Purchase of fixed assets for vessels decreased in 1965. This is viewed with some alarm since it means a stagnancy in equipment investment and will lead to inefficient operation. The decrease in equipment investment is a new aspect which could affect Japan's future position among fishing nations. ("Suisan Keizai Shimbun," Dec. 2, 1966.)

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ALBACORE PRICE STABILIZATION IS SUCCESSFUL

The first year's operation of the Japan Federation of Tuna Fishermen's Cooperative Associations¹ (NIKKATSUREN) 3-year albacore price stabilization program, launched in October 1965, is showing good results. The program was designed to promote canned

albacore consumption in Japan and to purchase and store summer albacore landings to adjust supply. It has contributed much toward keeping prices relatively high. Under the plan, when the summer pole-caught albacore prices drop below exvessel 150 yen a kilogram (US\$378 a short ton), the organization buys and stores the catch. The basic price of 150 yen a kilogram was based on production costs.

The 1966 price increase was due primarily to reduced supply; albacore production, including domestic landings and transshipments, during September 1965-August 1966 totaled about 110,000 metric tons, down 30,000 tons, or 22 percent, from the preceding 12 months. The program helped stimulate the upward trend. This resulted in rise of domestic exvessel albacore prices to an average of 160.25 yen a kilogram (\$403 a short ton). Thus, during the program's first year, there was no need to adjust the supply.

The Program's Rationale

This is the program's premise: If prices of albacore, which comprise about one-fifth of Japan's total tuna landings, could be maintained at a minimum level, particularly in the summer, when large quantities are harvested during a short period and exported mainly to the United States--it would also stabilize prices of other tunas. Thus, the Federation adopted the policy of promoting domestic demand to divert more supply to it, and also to store summer landings to counteract price decline. The program was established with a budget of 38 million yen (\$105,555). This will be met by assessing vessel owners 80 sen per kilogram (\$2 per short ton) for ship-frozen tuna landed in Japan, and 70 sen per kilogram (\$1.80 per short ton) for fresh tuna landings. ("Minato Shimbun," Nov. 7, 1966.)

* * *

UNIFIED TUNA FISHERY ADMINISTRATION UNDER STUDY

The Japanese Fisheries Agency is trying to improve management of the tuna fishing industry. It is considering means of consolidating administration of the coastal, distant-water, portable-boat-carrying mothership, and regular mothership fisheries, which presently are directed separately.

Japan (Contd.):

Under study is a formula permitting vessel transfers from one fishery to another at a set ratio--e.g., from the presently depressed mothership fishery to the distant-water fishery--thereby helping distressed vessel owners overcome management difficulties. The consolidation also would correct the present imbalance in vessel operations of the different tuna fisheries, eliminate operational violations and unsafe fishing practices, and protect the resources from overfishing. ("Shin Suisan Shimbun," Oct. 31, 1966.)

* * *

APPROVES ATLANTIC TUNA
TRANSSHIPMENTS TO SPAIN

The Japanese Fisheries Agency, requested by the Japan Frozen Tuna Producers Association, has agreed to authorize a 6,000-ton Atlantic transshipment quota for frozen tuna exports to Spain for the fiscal year ending March 31, 1967. The Agency had prohibited such transshipments for fear that Japanese tuna would be packed for export to the United States and compete with Japanese canned tuna. However, the growing tuna demand within Spain during the past three years, revealed by marketing studies, led the Agency to believe that the Japanese supply would not be transshipped. Presently, no restrictions are imposed on direct tuna shipments from Japan because their higher cost would not make it profitable for Spain to pack them for export. ("Katsuo-maguro Tsushin," Oct. 28, 1966.)

* * *

TUNA MOTHERSHIP FISHERY TO TRY
PLASTIC PORTABLE BOATS

The Japanese Fisheries Agency's Fishing Vessel Research Laboratory will construct a 5-meter (16-foot) long, reinforced plastic portable fishing boat for use by tuna motherships. It is scheduled to be completed by March 1967. The craft is one of three types the laboratory will design and test under a 3-year program to develop suitable plastic boats for the portable-boat-carrying tuna mothership fishery. ("Suisan Keizai Shimbun," Nov. 11, 1966.)

* * *

TRAWLER TO EXPLORE
OFF U. S. EAST COAST

The Japanese Overseas Trawlers Association, whose members agreed to explore jointly the western Atlantic Ocean to develop new trawl fishing grounds, will conduct initial operations off Florida's east coast. The Association was selecting a 1,000-ton class vessel capable of trawling at depths of 600-700 meters. It was scheduled to sail by the end of 1966 on a 40-day cruise.

A maximum budget of 80 million yen (US\$222,000) has been allocated for this expedition. The Association's trawl fishery development plan includes exploration of waters along the North and South American continents extending from Newfoundland to Patagonia, Argentina. If initial explorations off Florida proceed smoothly, the Association plans to expand the scope of operations progressively. ("Nihon Suisan Shimbun," Oct. 28, 1966.)

* * *

CONSULTANT SERVICE EVOKES
WIDE INTEREST ABROAD

The Fisheries Section established by the Japanese Society of Engineers in spring 1966 to provide consulting service to the fishing industry has aroused considerable interest abroad. It has received numerous inquiries for technical assistance and cooperation from foreign countries, including the Philippines, Denmark, Canada, Turkey, Uganda, and Nepal, and from the United Nations Development Program and the FAO Research Institute in Ecuador. To respond to the growing number of inquiries, the Society will form a corporation, named the Technical Consultants, Inc. The corporation will provide on a fee basis an information service, conduct surveys, and send experts abroad. ("Nihon Suisan Shimbun," Oct. 26, and "Suisan Keizai Shimbun," Oct. 21, 1966.)

* * *

START MADE ON LARGE
GOVERNMENT RESEARCH VESSEL

The construction of a 3,150-gross-ton research vessel, largest of its kind in Japan, began October 24, 1966, in Shimizu. It is being built for the Japanese Fisheries Agency at a cost of almost US\$5.6 million and will

Japan (Contd.):

be completed this summer. The vessel was designed to withstand operations in the polar regions. It will be equipped with the latest fishing gear and modern scientific instruments to measure oceanographic and meteorologic phenomena. Specifications: total length 82 meters (269 feet); beam 15 meters (49.2 feet); draft 9.2 meters (30.2 feet); maximum speed 16.5 knots; cruising speed 13.5 knots. ("Suisan Keizai Shimbun," Oct. 28, 1966.)

* * *

HAKE IS GAINING CONSUMER ACCEPTANCE

Hake (merluza) is gaining wider consumer acceptance in Japan as a result of the vigorous promotional campaign being conducted by the firm that first introduced it into Japan a few years ago. To overcome slow sales, the firm began promoting hake aggressively in August 1966 by means of television commercials, cooking demonstrations, leaflets, and in-store advertising. Sales during August-October 1966 totaled over 4,000 tons. The firm's Atlantic trawlers are harvesting the fish in large quantities off northwest and south Africa. ("Nihon Suisan Shimbun," Dec. 5, 1966.)

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TRAWLER EXPLORES FISHERIES OFF U. S. PACIFIC COAST

The 550-ton trawler "Mogami Maru," which returned to Japan in November 1966 after experimental hake operations off the west coast of the U. S. and Canada, left Tokyo December 1 on her second trip to the eastern Pacific. She was scheduled to work south from the previous area of operation (45°-50° N. latitudes) toward San Diego, Calif., and fish for 85-90 days. In previous operations off Vancouver, the Mogami Maru caught a daily average 25-30 metric tons of rockfish. ("Minato Shimbun," Dec. 1, 1966.)

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ATLANTIC TUNA LONG-LINERS REPORT GOOD FISHING

Japanese tuna long-liners operating out of Sao Vicente, Cape Verde Island, reported

good fishing in mid-December 1966. Catches amounted to 4-5 metric tons per vessel a day. Presently 13 Japanese tuna vessels are based there and 4 more are scheduled to join the fleet soon. Tuna delivery prices at the Cape Verde base were US\$480 a short ton for round albacore and \$460 a ton for gilled and gutted yellowfin. ("Suisancho Nippo," Dec. 14, 1966.)

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PURSE SEINER CONTINUES TRIAL TUNA FISHING IN SOUTH PACIFIC

The 210-gross-ton purse seiner "Taikei Maru No. 23," which conducted experimental tuna fishing in the South Pacific in 1966 with good results, departed Ishinomaki in northern Japan November 28, 1966, on her second trip.

The seiner, equipped with 2 power blocks, would fish for skipjack and yellowfin tuna in waters off the Mariana, Caroline, and Solomon Islands until early April 1967, then head north seeking bluefin off the Ogasawara Islands for one month en route home. It is reported that 5 other Japanese purse seiners, including the fishing firm Taiyo's 300-ton vessel under construction, are planning to conduct experimental fishing in the South Pacific in 1967. ("Suisan Keizai Shimbun," Nov. 23, 1966.)

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PURSE SEINING IS GOOD OFF NEW GUINEA

The 253-gross-ton purse seiner "Nissho Maru," which began fishing in the South Pacific north of New Guinea in November 1966, had caught 45 metric tons of fish in four sets by early December. Her catch was mainly skipjack tuna and some yellowfin. ("Katsuo-maguro Tsushin," Dec. 7, 1966.)

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ENDS TUNA MOTHERSHIP OPERATIONS IN SOUTH PACIFIC

The fishing firm Taiyo discontinued its mothership-type tuna operations in the South Pacific until 1970 because it had difficulty contracting catcher vessels to fish for the mothership. About 45 catcher vessels of at least 100 gross tons are required to conduct the operations. Due to improved tuna market

Japan (Contd.):

conditions, vessel owners now operating profitably by themselves prefer not to charter their vessels to mothership firms. Taiyo conducted two mothership operations in the South Pacific in 1964, one in 1965, but in 1966 could not send an expedition because of the catcher-vessel problem. ("Minato Shimbun," Nov. 27, 1966, and other sources.)

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COASTAL WHALE KILL WAS 2,348

As of November 30, 1966, the 4 fishery firms conducting coastal whaling had produced this record:

Company	Finback	Sei	Sperm	Total
		(No. of Whales)		
Taiyo	59	123	412	594
Nihon Suisan	1	83	926	1,010
Nitto Hogeï	18	48	337	403
Kinkai Hogeï	26	57	258	341
Total	104	311	1,933	2,348

Compared with the 1965 kill, Taiyo showed a slight decrease, Nitto and Kinkai about the same, and Nihon Suisan about 300 more whales. The season closed on December 15. Because of sea conditions, little change was expected in the catch data.

Soviets Enter Fishery

A Japanese periodical reported in early December on the effect of the Soviet whale fleets on the Japanese coastal whaling installations. The first Soviet whaling fleet was sighted by a Japanese vessel November 23, 1966, off Kinkazen (39°29' N. and 144°16' E.). The fleet consisted of 1 mothership (20,000-ton class) and 2 catcher boats. The 4 Japanese firms operating coastal stations are expressing alarm and anticipate additional fleets in the near future.

The companies are much concerned about the future of the resource. They are studying the possible ways to deal with the Soviet entry--an event that will decrease the number of whales coming inshore to the Japanese. One way would be to convert the land-based fishery to a mothership operation: to take the whales offshore in the area fished by the USSR. ("Suisan Tsushin," Dec. 2, and "Suisan Keizai Shimbun," Dec. 1, 1966.)

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LICENSES ONLY ONE FIRM FOR
1967 ARCTIC SALMON OPERATION

The Japanese Fisheries Agency, which has been studying a licensing policy for the 1967 salmon fishing in the Arctic Ocean, is permitting only one firm to operate there. The operation again is licensed on a trial basis. The firm selected is the one that sent the "Darin Maru No. 8" to the Chukchi Sea in July 1966.

The vessel harvested about 85 metric tons of chum salmon between 66°-68° N. latitudes. Some observers deduced from this that the area could become a new fishing ground. The Fisheries Agency received license applications from major operators involving 21 salmon vessels. In selecting only one firm, the Agency reasoned: (1) salmon resources in the Arctic Ocean are not very abundant; (2) while the area lies outside the International North Pacific Treaty waters, increased operations would irritate the U. S. and the USSR.

Some industry members believe that industry alone should not conduct the operations--that the Government should guide and supervise the operations, and confirm and publish the results. These members believe, too, that if the Government permits the operation of four 200-gross-ton vessels (their combined catch would not be over 400 metric tons), it would not hurt the resources, irritate other nations, and would help resource assessment. ("Suisan Tsushin," Dec. 9, 1966, and "Suisan Keizai Shimbun," Dec. 8, 1966.)

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SWORDFISH EXPORTS TO
U. S. AND CANADA ARE STEADY

Frozen swordfish validated for export to the United States and Canada during April-September 1966 totaled 2,301.9 short tons valued at US\$1,751,649. During the same period in 1965, 2,285.3 tons worth \$1,684,299 were exported. ("Suisan Tsushin," Oct. 31, 1966.)

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FROZEN TUNA EXPORT VALIDATIONS
WERE STEADY IN 1966 PERIOD

Frozen and fresh tuna validated for export during April-October 1966 were virtually the same as in the 1965 period:

Japan (Contd.):

Frozen and Fresh Tuna Exports, Apr.-Oct. 1966 with Comparisons				
	Exports to:			Total
	U.S.- Canada	Overseas Bases	Other Countries	
	.. (Short Tons) 1/ ..		.. (Metric Tons) ..	
Tuna:				
Albacore 2/	29,858	7,637	2,846	36,861
Yellowfin 3/	25,711	4,905	23,589	51,364
Big-eye 3/	1,677	818	6,704	8,968
Skipjack 2/	5,089	9	1,479	6,104
Bluefin 3/	-	-	1,318	1,318
Tuna loins	3,398	-	-	3,083
Apr.-Oct. 1966	65,733	13,369	35,936	107,698
Apr.-Oct. 1965	75,298	7,036	34,139	108,832

Frozen and Fresh Tuna Export Validations, October 1966				
	Exports to:			Total
	U.S.- Canada	Overseas Bases	Other Countries	
	.. (Short Tons) 1/ ..		.. (Metric Tons) ..	
Tuna:				
Albacore 2/	3,698.5	573.0	656.0	4,531.1
Yellowfin 3/	3,549.8	871.5	5,515.3	9,526.3
Big-eye 3/	142.1	-	542.6	671.5
Skipjack 2/	332.6	-	475.0	776.7
Tuna loins	525.0	-	261.9	738.2
Oct. 1966	8,248.0	1,444.5	7,450.8	16,243.8
Oct. 1965	8,928.0	1,747.6	2,013.5	11,698.5

1/ To convert short ton to metric ton, multiply by 0.9072.
2/ Round fish.
3/ Gilled and gutted, dressed, and fillets.

("Suisan Tsushin," Nov. 25, 1966, and other sources.)

ALBACORE EXPORT PRICE DECLINES

Japanese frozen albacore export prices for direct shipment to the U. S. have been weakening since mid-December 1966 because of lack of buying interest by U. S. packers and good catches in the Indian and Atlantic Oceans. Frozen round albacore of over 30 pounds which, in early December 1966, sold for US\$550 per short ton c. & f. U. S. west coast delivery, dropped by \$5 in mid-December and then declined further by \$15-20 a ton. Some Japanese observers view this price weakening as a temporary condition resulting from the completion by U. S. packers of their first round of albacore buying for Lent. ("Suisan Tsushin," Dec. 21, 1966.)

70 TUNA LONG-LINERS IN ATLANTIC

About 70 Japanese tuna long-liners were operating in the Atlantic Ocean in mid-December 1966. Most were fishing in the western Atlantic off Brazil, taking mostly albacore tuna, with landings averaging 2-3 tons a vessel a day. Other vessels were operating in the Caribbean Sea, North Atlantic off the Azores, and the central Atlantic Ocean.

Landings in the Caribbean were averaging 3-4 tons a vessel a day, with catch composition gradually shifting from yellowfin to albacore. Fishing off the Azores was good, with daily catch per vessel averaging 4-5 tons; catches consisted mostly of albacore mixed with big-eyed. In the central Atlantic, where yellowfin and big-eyed were being taken, fishing was slow. Since late November 1966, catches in the Atlantic gradually trended toward albacore. ("Suisan Tsushin," Dec. 16, 1966.)

CANNED TUNA SALES IN
FIRST 10 MONTHS 1966 ABOVE 1965

The Japan Tuna Packers Association offered for November 1966 sale 300,000 cases of canned tuna in brine for export to the U. S. This concluded the canned tuna in brine sales to exporters for the business year ended November 30, 1966. Sales through October 1966 totaled 2,060,000 cases. In 1965, through October 31, 1,840,000 cases were sold; through November, 2,170,000. ("Suisan Tsushin," Nov. 8, 1966.)

TUNA PRICES HIGHER IN LEADING PORT

Landings at the leading Japanese tuna fishery port of Yaizu in November 1966 totaled 7,152 metric tons worth 1,114,810,000 yen

Yaizu Fish Landings and Average Values with Comparisons, November 1965 & 1966						
	Quantity			Average Price		
	1966		1965	1966		1965
	Nov.	Oct.	Nov.	Nov.	Oct.	Nov.
	.. (Metric Tons) ..			(US\$/Metric Ton) 2/		
Tuna:						
Bluefin 1/ ..	3,009	4,056	3,971	675	646	492
Albacore ..	520	731	264	506	514	401
Skipjack ..	2,348	4,500	1,559	236	220	254
Mackerel ..	669	771	1,222	95	101	74
Others ..	606	876	847			
Total ..	7,152	10,934	7,863			

1/ Includes yellowfin and big-eyed tuna.
2/ To convert \$/metric ton to \$/short ton, multiply by .907.

Japan (Contd.):

(US\$3,097,000). Compared with November 1965, landings were down 711 tons but value was up \$355,000. Average exvessel prices, per short ton, compared with 1965 were: albacore \$459 (up \$96); skipjack \$212 (down \$18); mackerel \$86 (up \$20). ("Kanzume Nippo," Dec. 2, 1966.)

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1966 POLE-AND-LINE SKIPJACK TUNA LANDINGS WERE APPROACHING NEW HIGH

Excellent skipjack tuna landings by the Japanese pole-and-line fishery in 1966, totaling 165,582 metric tons as of mid-September 1966, seemed headed to top the post-war record of 170,284 tons in 1962. About half the live-bait skipjack fleet ended fishing around mid-October 1966. The remaining vessels off Japan--in the area of 38°-40°20' N. latitudes and 144°-146° E. longitudes in late October--met concentrations of bird-associated schools. Some vessels landed up to 20 tons a day. Pole-caught skipjack landings over the past five years were: 1960--78,608 tons; 1961--144,327 tons; 1962--170,284 tons; 1963--112,887 tons; 1964--166,763 tons; and 1965--119,700 tons.

Exvessel skipjack prices in Japan averaged 90 yen a kilogram (US\$227 a short ton) in January 1966, rose to 100 yen a kilogram (\$252 a short ton) in March and April, began tapering off in May and June and, in July, dropped to 65 yen a kilogram (\$164 a short ton)--down 30-35 percent from prices a year ago. ("Suisancho Nippo, Oct. 26, 1966.)

* * *

SKIPJACK TUNA FISHERY IS REGAINING STRENGTH

The Japanese pole-and-line skipjack tuna fleet has been building up, stimulated by good fishing in recent alternate years and growing demand. The fleet had begun to dwindle after 1956 as vessels were transferred to the then prospering long-line fishery. Although the present fleet still is far below 1965's peak year, the fishery is attracting increasing attention because of the declining catch rate in the tuna long-line fishery.

The pole-and-line skipjack operations based at Yaizu, Shizuoka Prefecture, Japan's

leading fishing port, illustrate the growing activity of this fishery. Skipjack vessels registered there, close to 50 in 1958, dwindled to a low of 8 in 1963, but gradually increased to the present 20; 3 more vessels are scheduled to be added this spring.

Factors Aiding Fishery Growth

Other factors contributing to the renewed interest in the fishery were the adoption of a brine-freezing system on skipjack vessels, and the later development of new fishing grounds in Pacific waters south of the Marianas. The improved keeping quality of fish taken from distant waters and growing acceptance of brine-frozen fish in Japan, coupled with increasing exports of frozen skipjack to the United States, have increased demand for the species. The result has been that the price instability of earlier years has been greatly reduced. ("Suisan Keizai Shimbun," Jan. 5, 1967.)

* * *

INCREASES YELLOWFIN DIRECT-EXPORT QUOTA FOR U. S.

At its November 17, 1966, meeting, the Japan Frozen Tuna Producers Association increased the yellowfin export quota for direct shipment to the U. S. and Canada for the business year ending March 1967--from 30,000 short tons to 35,000 tons. Direct yellowfin exports from April to November 1966 totaled 22,500 tons, averaging about 3,000 tons a month. At that rate, it was felt, the existing quota would be consumed by the end of 1966. Direct albacore exports to the U. S. up to early December 1966 totaled about 20,000 tons, 15,000 below the established quota. ("Suisan Keizai Shimbun," Nov. 23, 1966.)

* * *

FISHERY CATCH SETS NEW HIGH IN 1965

Fishery production, excluding whales, in 1965 hit a record 6,907,671 metric tons, according to data released November 8, 1966, by the Statistics and Survey Division, Ministry of Agriculture and Forestry. The 1965 production exceeds by almost 9 percent 1964's 6,350,706 metric tons; it exceeds by 0.6 percent the previous peak of 6,864,000 metric tons set in 1962. Squid and cuttlefish production marked a 51-percent increase over

Japan (Contd.):

1964; mackerel and sardines also showed substantial gains. But skipjack landings fell 18 percent below 1964. ("Suisan Tsushin," Nov. 10, 1966.)

1965/Catch of Principal Species by Type of Fisheries,			
Production by Type of Fishery	Quantity		Change from 1964
	1965	1964	
	.. (Metric Tons) ..		Percent
Grand total	6,907,671	6,350,706	9
Sea fisheries:	6,381,629	5,868,732	9
Fish:			
Alaska pollock	690,895	683,890	1
Mackerel	668,374	495,664	35
Horse mackerel	528,985	496,451	6
Sardines	405,906	295,897	37
Saury	231,377	210,689	10
Skipjack tuna	136,067	166,763	-18
Albacore "	127,341	116,487	9
Yellowfin "	123,589	123,493	0
Big-eyed "	110,486	112,256	-2
Bluefin "	55,904	61,026	-8
Salmon	145,662	117,378	24
Others	1,855,544	1,955,125	-
Molluscs & crustaceans:			
Clams	283,339	287,367	2
Squid & cuttlefish	498,367	323,374	51
Shrimp & prawn	67,963	79,433	-15
Crab	63,568	53,512	18
Octopus	78,057	66,975	17
Others	46,291	66,579	-
Mammals	2,277	1,679	36
Seaweeds	252,637	240,724	2
Shallow Sea Culture	379,800	362,993	5
Inland Water Fisheries ..	113,148	89,201	27
Inland Water Culture	33,094	29,780	11



South Korea

EXPLORES FISHING GROUNDS IN SOUTH CHINA SEA

A 150-gross-ton Government research vessel left Pusan on December 15, 1966, to explore and develop new fishing grounds in the East and South China seas. The 84-day, 9,000-mile cruise calls for trial fishing with trawl and long-line gear in waters off northern Taiwan, Hong Kong, Thailand, Singapore, Borneo, and the Philippines.

The vessel was sent by South Korea's Fishery Development Board and the Fisheries Agency in an attempt to compensate for the declining coastal and offshore fishery re-

sources. ("Suisan Keizai Shimbun," Nov. 23, 1966.)

UNABLE TO ENTER HIGH-SEAS MOTHERSHIP SALMON FISHERY

The Republic of Korea (ROK) may not be able to enter the mothership-type salmon fishery in the North Pacific this year, according to the Japanese Embassy in Seoul. ROK's proposed purchase of an 8,000-ton refrigerated factoryship with part of the US\$20 million fishery loan she is now negotiating with Norway may not be approved by that Government.

In 1966, ROK had planned to order an 8,000-ton mothership from Japan with part of the \$90 million commercial loans to be provided under the Japan-ROK Economic Cooperation Agreement. But the plan was abandoned because Japan decided not to help build vessels that might be used in the high-seas salmon fishery. So South Korea's salmon fishing this year will likely be limited to small-scale, land-based operations. ("Suisan Keizai Shimbun," Nov. 30, 1966.)



Taiwan

SEEKS LARGER WORLD BANK LOAN TO BUILD VESSELS

Taiwan, which is vigorously promoting development of its high-seas fisheries, is negotiating with the World Bank to increase its second loan application from US\$10.9 million to \$23 million. If approved, Taiwan hopes to expand its original program of purchasing sixteen 250-ton tuna vessels and four 1,500-ton trawlers. In 1964, the Government signed the first loan contract with the World Bank for \$7.8 million, with which to buy three 1,400-ton and thirteen 300-ton tuna vessels from Japan. All of these vessels are now in operation. Taiwan has about 55 tuna vessels operating out of American Samoa, 40 in the Indian Ocean, 4 at Espiritu Santo (New Hebrides), 6 at Port Louis (Mauritius Island), and 3 large vessels in the Atlantic Ocean scheduled to be reassigned to the Indian Ocean. ("Suisan Tsushin," Nov. 1, 1966.)



AFRICA

Ghana

STATE HAS 26 TRAWLERS

The trawler fleet of Ghana's State Fishing Corporation numbers 26, including 8 operated by Mankoadze Fisheries. The vessels were constructed in 4 countries: Soviet Union, 18; Japan, 3; Norway, 3; and the United Kingdom, 2. Total crew requirements are about 340. Recent discussions with the Norwegian Akers group may result in that group managing the Corporation's vessels. The group would also train Ghanaian personnel, a task formerly handled by Soviet technicians.

Japanese Trawler Contract Revised

Construction has been suspended on 5 of the twelve 750-ton trawlers contracted with Japan in 1965 for US\$1.6 million each. Four of the remaining 7 will be completed for Ocean Fisheries, a company owned by a Ghanaian businessman to whom the original Japanese credits are being extended. (U. S. Embassy, Accra, Dec. 15, 1966.)



South-West Africa

FISH MEAL PLANTS COMPLETE 1966 PILCHARD QUOTAS

The last of the 7 pilchard processing factories at Walvis Bay completed its 1966 quota during the first week of October. Each fish meal factory took its 90,000-ton quota with ease. ("The South African Shipping News and Fishing Industry Review," Nov. 1966.)



Foreign Fishing Off U. S. Coasts, December 1966

IN NORTHWEST ATLANTIC

Soviet: There were no Soviet fishing vessels on Georges Bank and vicinity during December 1966. A marked decline in mid-November was followed by a complete withdrawal

of all vessels by month's end. Since then, more than five weeks, no vessels were sighted. This is the first time in several years that the Soviet fleet has left Georges Bank for so long.

About 35 Soviet vessels were on Georges Bank and off southern New England during December 1965.

No Polish, East German, or Romanian fishing vessels were sighted on Georges Bank during December 1966.

MID-ATLANTIC BIGHT

Soviet: One medium trawler, sighted repeatedly off New Jersey and Virginia coasts, was presumed on exploratory trip.

IN GULF OF MEXICO

Soviet: No fishing vessels were sighted near U. S. coasts.

Cuban: Numerous vessels, mostly small, were sighted fishing in Straits of Florida and nearby channels and keys.

OFF CALIFORNIA

Soviet: Fishery research along California coasts has been conducted for several years. In early 1966, several research and exploratory fishing vessels were sighted--mainly in transit to and from newly exploited fishing grounds off Mexico (in Gulf of California and along Baja California) and in other Pacific areas.

In the first week of December, the 60-vessel Soviet fishing fleet off the Pacific Northwest since early April 1966 (8 months) left. It caught about 140,000 metric tons of Pacific hake and an undetermined amount of Pacific ocean perch. Most vessels sailed north to Hecate Strait area off British Columbia; some returned to Gulf of Alaska perch fishing grounds; some steamed to their Siberian home ports for repairs, overhaul, or change in crews. But about 20 moved south. They were reported on December 8, 1966, about 25 to 35 miles southwest of San Francisco; 9 large stern factory trawlers, 6 medium side trawlers, and 4 support vessels. They were fishing north of Cordell Bank and south of Farallon Islands along the 100-fathom curve, about 25 to 40 miles off California's northern coast (between San Francisco and Año Nuevo Point).



SOVIET VESSELS OFF SANTA BARBARA, CALIFORNIA: left, 3,000-gross-ton stern factory trawler "Ulianovsk" (crew of about 100); right, 10,000-gross-ton fish carrier and base ship "Arman" (crew of about 250).

There is no information on species fished but the area is traditional grounds for U. S. trawler fishermen seeking primarily rock-fish.

By the end of December, almost all vessels returned north; only 4-5 large stern trawlers and one 10,000-gross-ton refrigerated fish carrier remained.

OFF PACIFIC NORTHWEST (Washington and Oregon)

Soviet: Fishing activities were lowest since Soviet fleets appeared in April 1966.

During surveillance flights by U. S. Coast Guard during first 2 weeks in December, no Russian vessels were found. When area was checked the following week (Dec. 22), however, vessels were sighted. Two were off Washington and remainder off Oregon: 8 large stern trawlers, 2 medium side trawlers, and one support vessel. All were seaward of 12-mile contiguous fishing zone.

By December's end only 5 large stern trawlers remained off Oregon coast. When

sighted, their catch was primarily Pacific ocean perch.

OFF ALASKA

Japanese: Fishing activities increased during December. By month's end, there were 19 vessels.

The "Takachiho Maru" fished for perch off Southeastern Alaska until late December, then was replaced by the "Kirishima Maru." The "Ryuyo Maru" terminated perch operations on Albatross Bank about mid-month; it joined "Zuiyo Maru No. 2," "Kyoshin Maru No. 55," and "Tenyo Maru No. 3" and her accompanying trawler fishing for perch south of Fox Islands in eastern Aleutians. The "Taiyo Maru No. 82" and "Aso Maru" from Japan also joined this fleet at about same time. By late December, the Kyoshin Maru No. 55, Aso Maru, and Tenyo Maru No. 3 and her accompanying trawler departed--the Kyoshin Maru No. 55 returning to Japan, and the others switching to the pollock fishery north of the eastern Aleutians.

The Alaska pollock fishery north of the Fox Islands in eastern Aleutians was begun during December. The factoryship "Chichibu Maru" accompanied by about 8 trawlers began operations in mid-December; Aso Maru and Tenyo Maru No. 3 and her accompanying trawler from perch fishery south of Fox Islands arrived in late December.

Two long-liners fished for sablefish off Southeastern Alaska in late December.

Soviet: From 14 in early December, the Soviet fleet increased to 103 by month's end. This large increase resulted from transfer of vessels from hake and Pacific ocean perch fisheries off Pacific Northwest to perch fishery in the Gulf of Alaska and start flounder fishing in eastern Bering Sea.

In the Gulf of Alaska, in December 1966, Soviet perch operations were largest since June 1966. By month's end, many vessels had returned to Gulf from Pacific Northwest, and 20 trawlers and 10 support ships were

active on Yakutat grounds. Another 7 trawlers were fishing for perch along 100-fathom curve near Shumagin Islands at month's end.

The Shumagin Island shrimp fishery continued to increase in December--from 9 trawlers at beginning to 18 at month's end, the most trawlers in the fishery since it began in May 1965. With the arrival of a newly constructed 12,700-gross-ton canning factoryship, "Vasilii Putintsev," in late December, the processing method was changed from freezing shrimp in the round aboard trawlers to hand-peeling them for canning aboard factoryship.

An exploratory medium trawler was sent to the Bering Sea to conduct reconnaissance fishing for herring off the Pribilof Islands.

The Soviets began their eastern Bering Sea flounder fishery about one month earlier than usual: 10 vessels began fishing in mid-December. By month's end, there were over 50 vessels.



SEARCH AND RESCUE BY THE U. S. COAST GUARD

Modern search and rescue is a complex function, involving the closest cooperation between Coast Guard air, sea, and shore units. Most current means for attaining this coordination is the Automated Merchant Vessel Reporting program (AMVER) established in 1958. Nerve center for AMVER is the Coast Guard's Rescue Coordination Center in New York City. The program has proved so successful that it will soon be extended to the Pacific. Under AMVER procedure, vessels voluntarily report their positions periodically to the Coast Guard at New York. The data are processed by an electronic computer and provide the most current information for Coast Guard rescue coordination centers. Thousands of foreign and U.S. vessels are taking part in the program and the number is growing steadily.

Offering great promise in search and rescue is the new datum marker buoy. This is a device similar in size to a droppable sonarbuoy. It carries a small, battery-powered radio transmitter incorporated in a bomblike container. It can be dropped from aircraft at a height of 1,000 feet. On entering the water, the buoy floats and transmits a signal on UHF. This makes it possible for search and rescue aircraft to home in on it, using UHF direction finders.

The buoy has been successfully tested and is now undergoing operational evaluation. Recent studies show that the buoy can be operated for over 50 hours and its signal can be picked up by aircraft at a distance of 50 miles. (Release No. 16-65, U. S. Coast Guard, Washington, D. C.)

ARTICLES

THE SURF CLAM FISHERY

By Thomas M. Groutage and Allan M. Barker*

The 1965 surf clam (*Spisula solidissima*) fishery landed a record 44 million pounds of clam meats. New Jersey landings composed 96 percent of the total; the center of the fishery was Point Pleasant. Less than 2 percent of the total landings was used for fish bait. The hydraulic jet dredge was the principal gear. Sampling at Point Pleasant, Cape May, and Wildwood, N. J., provided data about the fishery. Daily catches averaged 355 bushels at Point Pleasant and 413 bushels at Cape May-Wildwood. Clams landed for processing had a mean shell length of 151 mm. (6 in.) at Point Pleasant and 139 mm. (5½ in.) at Cape May-Wildwood.

The surf clam is the largest bivalve mollusk living on the Atlantic coast (Miner, 1950). The fishery has existed since the late 1800s and contributes about 5 percent of the total U. S. annual shellfish landings. Regular sampling of the fishery was initiated in October 1964 when a field office was established at Point Pleasant, N. J., by the Surf Clam Program, Biological Laboratory, Oxford, Md. This report is a summary of the 1965 fishery.

FISHING AREA

Surf clams were harvested in two principal areas along the New Jersey coast. The largest and most productive grounds were between Barnegat Lightship and Point Pleasant (fig. 1). Point Pleasant, the center of commercial landings, had a total surf clam fleet of about 40 vessels. A few (2 to 5) boats were based at Barnegat Inlet. Depth of clam beds ranged from 15 to 37 meters (48 to 120 feet); average depth was 22.3 meters (73 feet). Point Pleasant boats traveled 1 to 3 hours to reach the offshore clam beds. Figure 1 also shows the second fishing area off Cape May. About 8 boats operated out of Cape May and Wildwood, traveling 1 to 2 hours to the inshore or offshore beds. Clam beds in this area were 9 to 37 meters (30 to 120 feet) deep--averaging 12.3 meters (40 feet) on the inshore beds and 21.3 meters (70 feet) on the offshore beds.

Plants in Point Pleasant, Cape May, and Wildwood received clams directly as the boats

*Fishing Biologists, BCF Biological Laboratories, Oxford, Maryland.

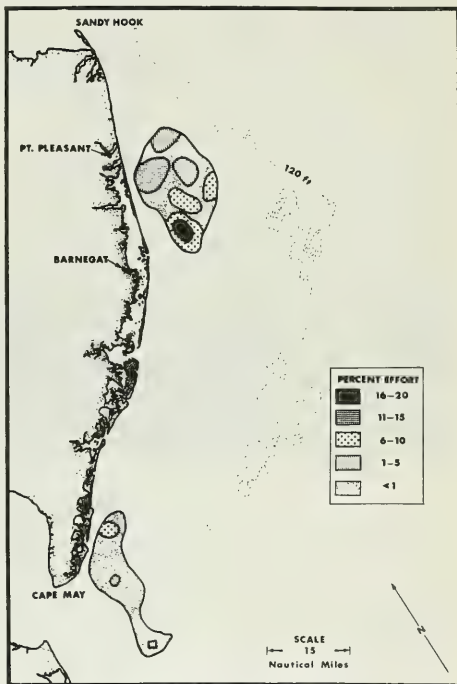


Fig. 1 - Location of surf clam dredging effort off the New Jersey coast in 1965 (percent of total New Jersey effort).

U. S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
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were unloaded and processed the clams the next day. Clams or clam meats were trucked to processing plants at: Port Norris and Leesburg, N. J.; Lewes, Del.; and Pine Point, Maine. Shucking was by hand although some mechanization assisted in cleaning. Fresh meats were canned or iced for shipment to markets and restaurants.

GEAR AND METHODS

Clam boats (fig. 2) are modified or converted vessels (trawlers, scallopers, and oyster schooners) from other fisheries. Surf clams are taken commercially with hydraulic jet dredges (Ropes, 1960; Dumont and Sundstrom, 1961; and Sundstrom, 1957). The bait clam fishery used small jet and other types of shellfish dredges, tongs, hand rakes, and hand picking on exposed intertidal sandbars (Brandt, 1964; Dumont and Sundstrom, 1961; and Sundstrom, 1957).

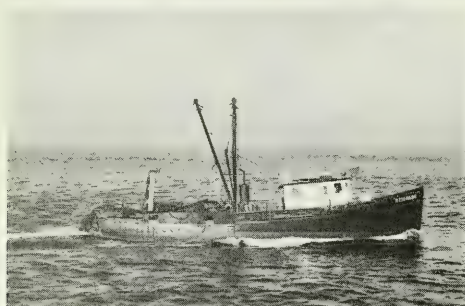


Fig. 2 - A typical surf clam boat heading for the fishing grounds.

With the exception of one experimental vessel, the boats made 1-day trips. Length of dredging time per trip varied from 1.5 to 17 hours at Point Pleasant and from 2 to 20 hours at Cape May; daily averages were 8.9 and 6.4 hours, respectively. Towing time per dredge haul varied with each captain, but an average of 4 tows were made per hour of fishing.

LANDING STATISTICS

New Jersey landings were sampled throughout the year at Point Pleasant and Cape May-Wildwood to obtain statistical data.

¹The table "Surf Clam Catch for the Atlantic Coast of the United States," is attached as appendix to reprint (Separate No. 780) of this article. For a free copy of the Separate, write to Office of Information, U. S. Department of the Interior, Fish and Wildlife Service, BCF, Washington, D. C. 20240.

Sampling was concentrated at Point Pleasant, but weekly visits were made to the Cape May-Wildwood area. Sampling was increased to twice weekly at Cape May-Wildwood in late winter and early spring, when effort increased in this area. Over 1,000 interviews of vessel captains were obtained for information on fishing location and effort; 785 samples from landings were examined for length of commercial-size clams (17,000 clams were measured). Twenty trips were made on commercial vessels, where 7,400 clams were measured from catches made in 214 dredge hauls. The amounts of surf clams landed along the Atlantic coast were taken from "Current Fishery Statistics" bulletins.

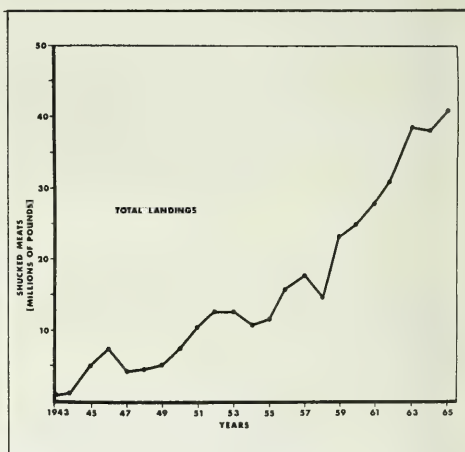


Fig. 3 - Annual surf clam landings, 1943-65.

Total landings of 44 million pounds of surf clam meats set a new high in 1965 (fig. 3 and table 1.) The previous high was 38.6 million pounds in 1963. Greater demand for the product, increased effort, and increased gear efficiency have contributed to this rise. Ninety-six percent (42.3 million pounds of meats) of the total landings were made in New Jersey, 3.4 percent (1.5 million pounds) in New York, and 0.6 percent (0.3 million pounds) in Maryland. Approximately 1.6 percent (660,000 pounds) of the total New Jersey catch, 25 percent (68,400 pounds) of the Maryland catch,

and 51 percent (766,000 pounds) of the New York catch, were used for bait in the sport fisheries.^{2/} Landings in Rhode Island and Massachusetts were insignificant and were used entirely for bait.

Over 79 percent (33.5 million pounds of meats) of the New Jersey landings were made at Point Pleasant and Barnegat. Winter weather restricted dredging in deeper waters off this area. In late January and February, about 20 boats moved from Point Pleasant and Barnegat to the Cape May-Wildwood area. The nearness of the fishing area to shore off Cape May enabled boats to operate during inclement weather. Most of these vessels returned to Point Pleasant before June. Daily landings per boat at Point Pleasant ranged from 510 to 18,820 pounds of meats (30 to 1,107 bushels) and averaged 6,035 pounds (355 bushels). Catch rate per hour of dredging averaged 678 pounds of meats (40 bushels) (fig. 5).

Cape May landings amounted to nearly 20 percent (8.4 million pounds of meats) of the New Jersey total. The shifting of effort from

Point Pleasant to Cape May-Wildwood, from February through May, accounted for high landings at Cape May-Wildwood during that period. The March total was the only one that surpassed Point Pleasant monthly totals. These large catches were produced by an extensive harvest of smaller clams from in-shore beds. In February through June, the daily catches per boat averaged 8,942 pounds of meats (526 bushels); the hourly catch rate was 1,542 pounds (90 bushels) (fig. 5). Catch diminished rapidly at Cape May in July when the boats moved offshore to catch the less numerous but larger clams (fig. 4). From July through October, the catch rate per hour was 496 pounds of meats (29 bushels). In November and December, the boats again dredged near shore and catch increased slightly to 697 pounds of meats (41 bushels) per hour (fig. 5).

Lengths of surf clams landed at Point Pleasant were relatively uniform (fig. 4). A total of 12,910 clams measured throughout the year had a mean shell length of 151 mm. (6 in.) and a range of 120 to 180 mm. ($4\frac{3}{4}$ to $7\frac{1}{8}$ in.)--fig. 6. Clams landed at Cape May-

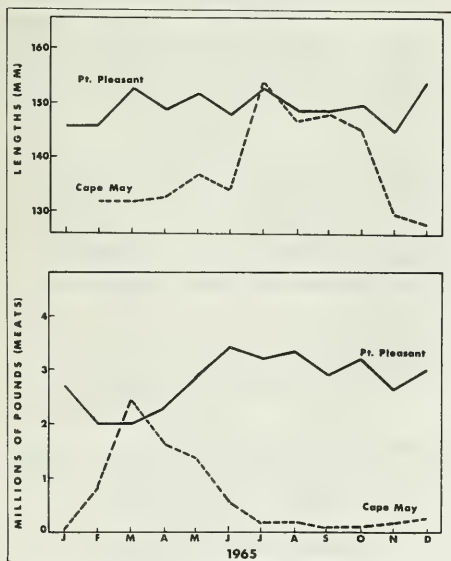


Fig. 4.- Mean lengths of surf clams and monthly landings of surf clam meats in New Jersey in 1965.

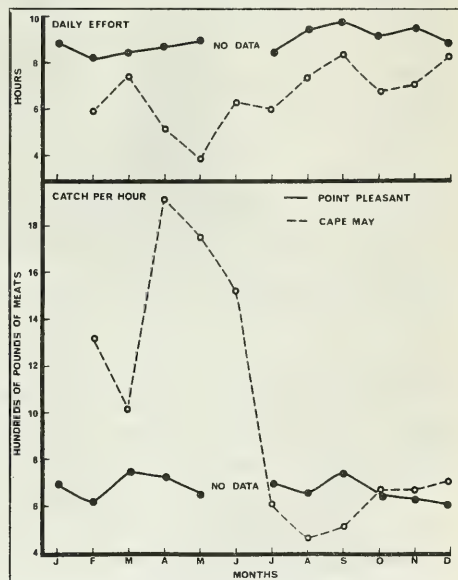


Fig. 5 - Monthly averages of daily effort and catch per hour at Point Pleasant and Cape May, New Jersey, 1965.

^{2/}Data provided in personal communications from BCF, Office of Statistical Services, Fishery Reporting Specialists, in the respective states.

Wildwood had a smaller mean length than Point Pleasant clams; for 4,466 Cape May clams measured throughout the year, the range was 105 to 180 mm. ($4\frac{1}{8}$ to $7\frac{1}{8}$ in.) and the mean length was 139 mm. ($5\frac{1}{2}$ in.)--fig. 6. The difference in lengths between clams in the inshore and offshore beds is evident in figure 4; the lengths for February through June, and for November and December, were determined from inshore clams.

At Point Pleasant, amounts of small clams (less than 130 mm. or 5 in.) discarded at sea

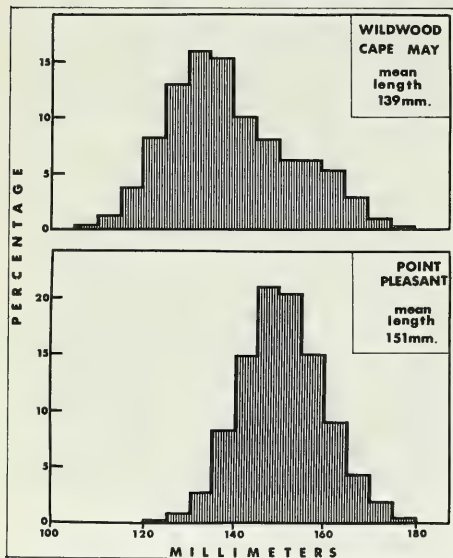


Fig. 6 - Surf clam lengths in 1965 commercial catch (139 mm. = $5\frac{1}{2}$ in. and 151 mm. = 6 in.).

were negligible--about 1 bushel per 200 bushels landed. No clams were discarded in the Cape May-Wildwood area.

STATUS AND TRENDS OF THE FISHERY

Information from interviews with vessel captains indicates fishing effort has increased in the last few years. The average length of surf clams caught in the Barnegat Lightship area, however, has remained at about 150 mm. (6 in.).

Many factors affect the catch and effort of the surf clam fleet. Weather is perhaps the most important limiting factor in boat operation, hampers proper dredging, and increases hazards to the crews in handling dredges. Data in this report do not emphasize the importance of wind because the larger, more efficient boats were able to fish during adverse weather and make higher catches than the fleet average during good fishing conditions.

The industry imposed catch quotas at various times to compensate for slight fluctuations in supply and demand. Size preference was a minor factor in limiting production--shuckers dislike processing small clams because their salary depends on the volume of meats shucked. Also, the smaller the clams, the less return in pounds of meats per bushel to the processor. Production of surf clams has been relatively stable; fluctuations in supply and demand have not been marked. The industry appears to be in a healthy condition, satisfying the increasing demand for its product. This orderly expansion of an industry is heartening. It contrasts with the general decline or stabilization in production of many other shellfish industries (Engle, 1966).

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TECHNOLOGY'S ROLE IN THE SEAFOOD INDUSTRY

By Harold B. Allen*

BCF's Branch of Technology is a tool for helping the fishing industry. The Branch has inspectors, scientists, engineers, and technicians in laboratories throughout the United States—in Gloucester, Massachusetts; College Park, Maryland; Pascagoula, Mississippi; Ann Arbor, Michigan; Terminal Island, California; Seattle, Washington; and Ketchikan, Alaska. There are small ones employing 5 to 15 people; 4 are larger and have 15-25 employees. Many of the scientists have advanced degrees in engineering, bacteriology, chemistry, and nutrition.

The Branch also includes a nationwide inspection service with fifty-six inspectors. They work in 10 lot-inspection offices in major cities and in 33 fish and shellfish processing plants.

WHAT ARE THE PROBLEMS?

The technological problems are many and complex. They begin on the fishing vessel—before the catch is removed from the water. They involve losses in quality when fish are left in gill nets or purse seines too long. Then, as the catch is brought aboard, the technological problems begin to multiply: techniques must be found to preserve or process quickly and economically the wide variety of fish and shellfish taken in different parts of the country.

As we move our catch into shore-based processing plants, or to fresh and frozen fish markets, a new challenge arises: the need to process and market extremely variable and diverse products in competition with other protein foods, such as poultry, eggs, meat, and milk. Processors of these other foods have a distinct advantage. Their raw material is more uniform in size, shape, quality, and perishability and can be handled in large volume. These agricultural foods can be grown and harvested at the ideal time—rather than hunted and caught when opportunity permits.

A new set of problems arises as our fishery products are merged with other foods in the

retail distribution chain. With the possible exception of fresh fish, the product leaves the control of industry at that point. The technical and quality problems encountered in the distribution of frozen fish have been highlighted in Consumers Union Reports since 1961. The magazine stated that up to 40 percent of the fish and shellfish tested in the marketplace was substandard in quality; as a possible solution, it recommended adoption by the States of the Frozen Food Code of the Association of Food and Drug Officials of the U. S.—and mandatory Federal inspection from the boat level forward.

A final technological problem is that we have not developed the technical know-how and processing methods to utilize the many abundant species of fish that do not now enjoy wide industry and consumer acceptance. As examples, mullet, mackerel, hake, and shark are not being utilized because industry concentrates on salmon, haddock, and flounder. I believe that products can be developed from these underutilized species that will tempt the consumer and increase sales.

HOW BCF SERVES INDUSTRY

How is Government using its tools—scientists and laboratories—to help industry solve its many problems?

One principal activity is research leading to quality improvement. Studies on improving quality are being carried out in our 7 laboratories. At Terminal Island, for example, we are working to improve the quality of raw tuna as it reaches the cannery by learning more about the effect of harvesting methods and vessel-refrigeration techniques on the condition of the fish. In Alaska, we are developing better means of maintaining the color and flavor in northern shrimp. In Seattle, our scientists have gone to sea on halibut vessels in search of better means of icing and storing the catch in a vessel's hold. A technique was developed for washing the blood from the large dorsal vein, thus preventing the development of dark areas in halibut steaks.

*Chief, Branch of Technology, BCF, Washington, D. C.

QUALITY STANDARDS ADOPTED IN 1958

Perhaps the most significant overall quality-improvement program is the development of official U. S. Standards for fishery products, and the inspection service based on these quality standards. Since the program was started in 1958, fifteen standards have been developed and promulgated. Even more Federal and State purchase specifications have been developed. In 1965, 230 million pounds of fishery products were inspected or certified under our program. More than any other, this program illustrates Government and industry cooperation in quality improvement.

Our laboratories in Pascagoula, Mississippi; Ann Arbor, Michigan; and Seattle, Washington, are working to solve microbiological problems encountered by industry. The work by scientists at Ann Arbor has resulted in the development of a three-part smoked-fish sanitation manual; Part I, "Sanitation in the Processing Plant," is being printed and should be available for distribution about March 1967. Part II, "Sanitation on the Fishing Vessel," is in draft status and being reviewed. The first draft of Part III, "Processing Procedures," will soon be completed. The laboratory, industry, the States, and cities, are playing vital roles in controlling bacteriological problems.

UTILIZATION RESEARCH

Another broad area of study where we are finding solutions to problems is utilization research. Industry is not utilizing fully such species as hake, mullet, alewife, and anchovy. Therefore, food and industrial studies are underway in Seattle to develop new food and industrial products. Our present efforts are aimed principally at shark and hake. Work in the future will involve other species. To date, the most promising results have been obtained in such industrial products as refined shark oil and hake fish meal; but excellent shark steaks and hake breakfast sausages have been prepared. These developments may foreshadow basic changes in the species composition of our domestic catch.

FUTURE OF FISHERY TECHNOLOGY

Research is already far advanced in BCF laboratories on processes that will be important to the industry's future. One is radiation preservation of "fresh" fish. The irradiation of fish at the time of packing can double the

normal high-quality shelf life--and enable marine species to reach inland markets in prime condition.

Our Marine Products Development Irradiator in Gloucester, Massachusetts, irradiates fishery products and for evaluation, test-ships many of them to army bases and laboratories in different parts of the U. S.

During summer 1966, this research program was expanded to include shipboard irradiation studies. A small irradiator was placed aboard our Gloucester exploratory fishing vessel "Delaware" to study irradiation at the moment of catch. The purpose was to prevent the loss of quality normally experienced at sea. We have been pleased with the preliminary results and feel this approach has much promise.

FISH PROTEIN CONCENTRATE (FPC)

One of our most exciting and far-reaching programs is the manufacture of fish protein concentrate (FPC). The object is to develop a manufacturing process for an inexpensive and high-quality protein food that meets the approval of the Food and Drug Administration. We have now completed the program's first phase with the development of a solvent-extraction process. A petition requesting approval was submitted to the FDA in February 1966. FDA has periodically requested additional data, which we have been providing.

Congress recognized the potential value of FPC when it authorized the leasing and construction of two pilot demonstration plants and the associated research. Once these plants are available, our scientists will be able to carry out engineering and design studies needed by private industry to construct larger, full-scale commercial plants. FPC produced in these pilot plants will be used in feeding studies to test the feasibility of incorporating it in the many different foods consumed in developing countries. In this way, markets will be established for FPC, which will be produced commercially at a later date. We believe the FPC program has a tremendous potential for improving the economic condition of the U. S. fisherman and providing badly needed protein to the hungry people of the world.

BASIC RESEARCH FOR FUTURE

The research that leads us farthest into the future is often termed "basic." Much of it

is underway at Gloucester to determine the fundamental cause of toughening in fish when it is frozen and held in storage. Results have already shown that toughening results from a bonding of the natural protein and oils in the fish meat. If this bonding can be prevented, it may be possible to maintain the full quality and texture of fresh fish in the frozen product.

Similar studies on the basic cause of "fishiness" in fishery products when they are cooked are being carried out in Seattle. These odors are associated with the oxidation of the natural oils in fish. If we can control oxidation--and perhaps thereby control this fishiness--it may be possible for a housewife to cook fishery products with no fear that an unpleasant odor will be left in her kitchen.

If we look even farther into the future, we see an area where no technological work is now being done but which has considerable need and promise. Of prime importance is the need to develop space-age fish-handling techniques for use aboard U. S. freezer trawler vessels. Such techniques might include containerization of an entire fish hold so that it

could be lifted from the vessel as it reaches dock and be replaced by an empty hold. The vessel then could more quickly return to the fishing grounds.

A refinement of this concept would be to seal the hold after the fish are placed inside and then pump out the air. Replacing the oxygen-laden air with a controlled atmosphere of nitrogen and carbon dioxide could greatly extend the storage life of fish by slowing natural bacterial growth and oxidation. This process would be especially useful in landing high-quality fresh fish.

Another plan might involve irradiation, freezing, filleting, or FPC manufacture at sea. Any of these processes could be undertaken on the fishing grounds with no need for the vessel to return to port. Instead, cargo vessels could bring the finished product to port and supply the fishing vessel with fuel and, perhaps, with replacement crews.

There exist many other far-out possibilities for our industry if we think in space-age terms. I believe we should.



RADIATION PRESERVATION OF SEAFOOD

U.S. DEPARTMENT OF THE INTERIOR • BUREAU OF COMMERCIAL FISHERIES

**FRESH SEAFOOD ON ICE
WILL KEEP ABOUT 14 DAYS**

**IRRADIATION
WILL DOUBLE THIS
KEEPING TIME AND
INCREASE
FRESH FISH SALES**

**HIGH QUALITY
FRESH FISH
WILL REACH**

LAND MARKETS

**COOPERATIVE
RESEARCH • INDUSTRY
GOVERNMENT • STUDIES**

**TECHNOLOGICAL RESEARCH
WILL ENABLE • TO EXTEND YOUR
MARKETS FOR FRESH FISH BY**

- 1. Extending the shelf life of fresh fish
- 2. Reducing the need for ice and refrigeration
- 3. Improving the quality of fresh fish
- 4. Increasing the availability of fresh fish
- 5. Reducing the cost of fresh fish
- 6. Improving the safety of fresh fish
- 7. Increasing the variety of fresh fish
- 8. Improving the appearance of fresh fish
- 9. Reducing the waste of fresh fish
- 10. Increasing the profitability of fresh fish

Exhibit demonstrating the usefulness of radiation preservation of seafood.

Catches of up to 18 metric tons of yellowfin and 17 metric tons of skipjack per set were made with a new experimental 550-meter purse seine.

EXPERIMENTAL PURSE SEINING FOR TUNAS IN PORTUGUESE WEST AFRICA 1/

By Fernando Correia da Costa and David Bragança Gil

(Translated from Portuguese by John P. Wise*)

Capture of tunaby purse seines was made possible by technical advances in two fields--the discovery of new fibers for making nets and the invention of mechanical devices for hauling nets. Before these developments, ordinary purse seines had been used to capture the tunas so abundant in various parts of the world. Good results were achieved only occasionally. It was soon recognized that future attempts could only be profitable with gear designed especially for the purpose. This gear, if possible to construct, would consist of larger nets made of stronger twine. However it would be difficult to handle; actually, such nets made of traditional fibers would be too heavy for manpower alone to manage.

The first step toward solving the problem appeared in the development of synthetic fibers, much stronger and lighter than vegetable fibers. This made possible the construction of larger and stronger--yet lighter nets. Although the weight problem had been solved, the larger nets made manual handling slow and exhausting.

The second step was the development of the mechanical hauler or power block. This gear is handled easily and is relatively simple to install without major modifications of traditional vessels. It opened the way to fishing with large purse seines; seining for tunas became practical. Now seining is practiced profitably in all countries that have proper oceanographic conditions along their coasts or in nearby waters.

*Fishery Biologist, BCF Tropical Atlantic Biological Laboratory, Miami, Florida. Certain editorial changes were made in translation, with the authors' approval, to improve readability.

1/"Ensaio de pesca de 'atum' em Angola com rede de cerco para bordo."

Note: "Notas Mimeografadas do Centro de Biologia Piscatória, No. 45," July 1965. Published by "Junta de Investigações do Ultramar," Lisbon, Portugal.

In Angola, Portuguese West Africa, a live-bait fishery for tunas has existed for several years. Some owners and captains of traditional seiners have tried to catch tunas with nets normally used for sardines and other pelagic fish. Although some catches were made, the idea was not followed up for practical reasons. Larger and stronger nets were needed, but these could not be handled in the ordinary manner.

At the beginning of 1961, following its policy of experimentation and practical demonstration of new fishing methods, the Marine Biology Mission installed on its research vessel "Sardinella" a mechanical hauler for purse seines. (See "Notas Mimeografadas do Centro de Biologia Piscatória," No. 34.) In 1963, a tuna purse seine was bought from an American firm that was designed with the Sardinella's available power and power block in mind.

MATERIALS

The Sardinella is a wooden "Portuguese seiner" type built in Angola in 1958:

Maximum length	23.1 meters
Length between perpendiculars	19.1 meters
Draft midships	2.4 meters
Beam	5.3 meters
Tonnage	123.26 gross tons

The main motor is a Bohn and Kahler 6-cylinder diesel developing 160 hp. at 600

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r.p.m., for a speed of about 7 knots. The powerblock is American made, "Marco Type 28F - 2000 GR," with a pulling force of about 800 kilograms and a drum capacity of about 90 centimeters (maximum circumference of compressed net). (For more details, see "Notas Mimeografadas do Centro de Biologia Piscatória," No. 34.)

As would be expected, the *Sardinella* also had a mechanical winch driven by a 30-hp. auxiliary motor. This low horsepower and the winch's bad condition necessitated some changes. We thought first of a hydraulic winch, but its larger size and possible parts and maintenance problems made us settle for an ordinary mechanical winch made in Angola. This is driven from the main engine and has two speeds and two gypsies of different sizes on each side.

It was first proposed that we design a net for seining tuna from the *Sardinella* and that it be constructed in Angola. This would have meant a typical machine-knotted net. Because the net was the first of its sort for seining tuna in Portugal and there was no unanimous opinion on the best type, we were compelled to design it from general information about seines and our knowledge of Angolan tunas. We thought the "American purse seine" used in Portugal would be a suitable base. This seine has the following characteristics:

Length of cork line	675 meters
Depth (slack)	75 meters
Overall mesh (bar)	40 millimeters
Bag { Length	75 meters
{ Depth	30 meters
{ Mesh (bar)	30 millimeters
Cork line selvage (bar)	40 millimeters
Lead line selvage (bar)	80 millimeters

The webbing is nylon twine, about 1,000 meters/kilogram overall, and about 800 meters/kilogram in the bag and selvages. We considered modifying the bag's design to the Icelandic type, cut in steps, because we believe this is the only proper type for mechanical hauling.

However, we decided later that our power block and vessel could not handle the weight involved. Finally, we turned to the idea of a knotless net, ending the notion of having it made in Angola. The most efficient knotless mesh, principally from the standpoint of strength, seemed to be the American "Tri-

lock nylon combination." We ordered one from the United States Net and Twine Co., Inc.; it was made under the direction of Borti Petrich.

The net is about 550 meters long and 70 meters deep. Its total weight, including leads and floats, is about 6,500 kilograms. The purse line is nylon with an outer winding on an inner core for extra strength; it is the Americantype "Samson 2 in 1," 25.4 millimeters in diameter and 580 meters long. We had to use this rather than steel cable because it was impossible to mount the necessary winch for steel on the *Sardinella*. We still believe that the purse lines normally should be steel, although the substitute proved satisfactory in all respects.

The net is divided in two parts by a splitting arrangement ("zipper"), making it possible to divide the catch in case of a large set. This arrangement is simply a line of small rings running up a reinforced strip of netting. A line made fast to the lead line passes through the rings with its free end passing out at the cork line; a pull on this line splits the net. This system is commonly used in the U. S. It was incorporated in our gear at the manufacturer's suggestion.

There are two other important design features:

a) Unlike the classic Portuguese net, the net does not form pockets at the bow and stern of the vessel. For this reason, taking the basic idea from Mr. Petrich, we had installed along the extreme end of the net and along the side of the bag a line of small rings through which passes an auxiliary line. When drying up is nearly completed, this line is pulled in when necessary. This pulls the net together--bunching up the corks and forming a large pocket under the cork line--and prevents fish from jumping out of the net when they are crowded by it. The same rig was installed on the other end of the net and along the cork line of the center of the bag; however, the latter had to be removed because it created problems during hauling.

b) There are 20 small rings along the lead line under the bag. This permits fastening the bag securely to the vessel's rail while brailing.

Because we were forced to use a net whose weight and volume were adapted to the

existing vessel and power block, we not only had to choose a knotless net but also to limit the twine's diameter to a minimum. We found the net efficient for fishing, but it was too weak under certain conditions. In the future, we could have larger meshes and heavier twine, maintaining the gear's weight and volume about the same. Nonetheless, after using the net, we consider it very good, subject to the limitations mentioned.

OPERATIONS

The *Sardinella*'s limitations led us to select a "European system" fishing method--seining with live bait. This is distinguished from the "American system," which does not use bait. The low power of the vessel's motor (160 hp.) does not permit speeds of more than 7 or 7½ knots, just about eliminating chasing or seining moving schools. In the European system, the bait boat acts as a "brake" on the school; it works closely with the seine vessel and permits the latter to make sets on schools stopped by the live bait.

The low power (about 25 hp.) of the available bait boats allowed speeds of only 5½ or 6 knots. This, plus the small holding capacity of the bait tank (about 1.5 cubic meters), ruled out scouting for fish over large areas. These boats can work at sea only 12 to 14 hours and are limited to operating close to port--on the continental shelf, or a little beyond. This limited our operations and the information we could obtain on possible offshore tuna fishing.

The net's design considered many factors; it should have been restricted to catching small schools of small to medium fish. On one occasion, to test the net, we deliberately ignored the limitation and made a set around an estimated 30-ton school of large fish, about 40 kilograms each. Although we caught 18 tons, we proved in fact what we knew in theory--the larger part of the school escaped by breaking through the net.

It is well known that one principal cause of the movements of tunas is related to the water's temperature and salinity. Tunas are limited in their ability to withstand large changes in temperature and salinity, and their migrations are affected by these and other factors. Our knowledge of local oceanographic conditions is somewhat limited. This, and the vessel's limited range, did not allow us to select the best fishing grounds.

Our scouting was held to traditional methods--looking for birds, surface or subsurface schools, or just prospecting where tunas have been found.

Around Baia Farta, the tunas come from the north and begin to show up around mid-September; they stay until the end of April or the beginning of May, when the cooling surface waters sends them north again. It seemed obvious to us that the best months for finding large concentrations are October to January, especially November-December. However, reasons beyond our control made it impossible to begin then. The first trials for testing gear and training ran from the latter part of December 1964 to early January 1965. Only then, in mid-January, was it possible to have everything ready to begin the actual fishing experiments.

To sum up, we had to limit our work in several ways:

- a) to seine with the aid of live bait;
- b) to start in January, past the peak of the season;
- c) to catch fish of 15 to 20 kilograms in small or medium schools;
- d) to scout within 30 or 40 miles of port; and,
- e) to scout for tunas only in the usual places and by the traditional methods.

The operations were carried out in the following sequence.

1. Dummy sets, without attempting to catch fish, were made from the *Sardinella*;
2. Dummy sets, without attempting to catch fish--the *Sardinella* working with live bait launch;
3. Fishing sets, seining tuna schools with the aid of live bait.

The first group was carried out to test gear and to give the crew sufficient practice in handling the new net. These tests were conducted over known areas of clean bottom at or near the entrance to Baia Farta, under various weather and sea conditions, until we were convinced that men and gear were ready for the next phase.

After the first phase, we worked on getting the two fishing vessels and their crews (with basically different habits) to function together as a single unit.

When we were ready to scout and fish with the seine vessel working with the bait boat, we began the third phase. We set up certain operational procedures:

1. The two vessels operated as a single fishing unit;

2. The bait boat scouted in the usual manner for pole-and-line fishing;

3. The seine vessel followed the bait boat at a determined distance, directly astern when possible;

4. The boats were in constant contact by walkie-talkie radio;

5. Scouting was carried out visually from both vessels--by looking for birds or jumping fish;

6. A Marine Biology Mission scientist in charge of the joint operation was aboard the bait boat;

7. When the bait boat sighted signs or actual fish, it began operations as if it were going to fish by the usual method;

8. The scientist aboard followed developments closely and decided the appropriate time to radio the seine vessel to begin setting;

9. A firm rule held that the bait boat should chum and prepare the fish without, however, fishing;

10. Rules had been set up for setting the seine: the set should be begun as far as possible from the bait boat, made rapidly, and the seine should be closed as close as possible to the stern of the bait boat;

11. Rules were set for the bait boat: Continue chumming generously, without stopping, during seine set until rings were aboard seine vessel; steam around inside seine, find best

Details of Sets Nos. 10-25 of the Experimental Purse Seine^{1/}

Set No.	Date (1965)	Catch		Observations
		Species	Weight (Kg.)	
10	12 Jan.	Skipjack	400	Set too close to bait boat - fish dived
11	12 Jan.	-	0	Attempted to set without chumming
12	12 Jan.	Skipjack	2,000	Small school - good set
13	16 Jan.	Skipjack Frigate mackerel (few) Yellowfin (3)	17,000	Good set - only a few escaped
14	19 Jan.	Skipjack Frigate mackerel (few) Shark (1)	450	Big school - bad set with large opening - radio failed
15	27 Jan.	Dolphin (many) Yellowfin (14) Skipjack (6) Shark (2)	500	Good set
16	27 Jan.	Yellowfin Bigeye (2)	18,000	Big school - good set - many fish broke through net
17	2 Feb.	Skipjack Frigate mackerel (few) Yellowfin Shark (20)	16,000	Big school - set with large opening - many fish escaped
18	20 Feb.	Yellowfin (1,500 kg.) Skipjack (1,000 kg.)	2,500	Big school - fish dived because bait died as net was set
19	6 Mar.	Skipjack Yellowfin (few) Bigeye (few) Shark (1)	250	Few fish - not feeding well - good set
20	17 Mar.	Skipjack Frigate mackerel (few)	150	Few fish - not feeding well - good set
21	17 Mar.	Skipjack	150	Few fish - not feeding well - good set
22	30 Mar.	Skipjack Little tuna (few)	5,000	Small school - good set
23	30 Mar.	Skipjack Yellowfin Jack	300	Few fish - not feeding well - good set
24	2 Apr.	Skipjack	50	Few fish - not feeding well - good set
25	2 Apr.	Skipjack	700	Few fish - not feeding well - good set

^{1/}All sets within 15 miles of 13°00' E. and 12°35' S., except No. 18 about 40 miles southeasterly of this position. None over 20 miles from the coast.

position to prevent escape of fish--remembering the bait boat should stay away from net itself, especially from opening, try to guide school into the circle, especially when net is almost closed (these maneuvers produced excellent results in preventing escape of fish during setting and pursuing);

12. Once pursing is completed, the bait boat leaves the circle and, by means of a tow line, helps the seine vessel keep away from body of the net as it is lifted by power block;

13. When this operation is over, the bait boat helps with the drying up by taking part of the cork line aboard; when there are plenty of fish, this operation keeps tunas from sinking cork line and escaping over it.

The total number of sets made was 25: six dummies were carried out for practice with the gear and training the Sardinella crew; 3 for practice with two vessels operating together; and 16 (numbered 10-25), actually fishing with live bait and the seine.

Species captured in order of value were: skipjack (Katsuwonus pelamis), yellowfin (Thunnus albacares), frigate mackerel (Auxis thazard), bigeye (Thunnus obesus), little tuna (Euthynnus alletteratus), dolphin (Coryphaena hippurus), jack (Caranx angoulensis), and sharks (various species).

The total capture for the 16 sets was 63,500 kilograms, or about 4 metric tons average per set. Skipjack (42,000 kilograms) and yellowfin (19,000 kilograms) made up almost the whole catch, with only 2,500 kilograms of other fish.^{2/} Because of the small number of sets, it is not now possible to draw conclusions about the economic yields. Study of this question will be feasible in the near future only after an intense campaign set up as in commercial fishing and covering a whole season. The relatively low capture per set (3,968 kilograms) was due to the experimental nature of the work, attempts to set as frequently as possible in all conditions to test the net, and problems previously mentioned. (See observations in table.)

^{2/}Fernando Correia da Costa mentioned in conversation that this work was carried on from November 1965 to February 1966, with about 20 more sets. Catches were about the same order of magnitude, but skipjack predominated even more heavily--Trans.
Note: The listing of the materials and dimensions of the seine net is attached as appendix to reprint (Separate No. 782) of this article. For free copy of the Separate, write to Office of Information, U. S. Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D. C. 20240.



CONCLUSIONS

1. It is possible to catch tunas by purse seine on coast of Angola.

2. Practical results were obtained using "European system"--seining with aid of live bait.

3. The length and height of the net used were adequate to capture tunas at surface and below it.

4. The twine used and the knotless net proved adequate for small and medium schools (to 20 metric tons) of fish up to about 15 kilograms.

5. The mesh used, 7 centimeters stretched, could be a centimeter larger without danger of gilling the smallest fish caught (about 1.5 kilograms). To capture larger schools and/or larger fish, it would be advisable to double diameter of the twine.

6. The design of the net bag was completely satisfactory with regard to strength, even for fish averaging 40 kilograms.

7. We believe an increase in number of corks or use of larger corks would increase buoyancy of net, which appeared insufficient at times.

8. Observations made on fish of same species and size, landed on same day and place with same number of fishing hours and methods of handling aboard, but caught by different methods--seining and live bait--showed that seined fish were "riper." The seined fish could be processed immediately by the factory, while hook-and-line fish had to lay over until the next day. We believe this "hardening" is due to the struggles of seined fish during capture and lifting aboard.

9. It is not yet possible to say whether seining is economically practical because of the experimental nature of this work. A further study covering at least a whole season and carried out on commercial fishing lines is necessary.

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UNITED STATES DEPARTMENT OF THE INTERIOR
STEWART L. UDALL, SECRETARY

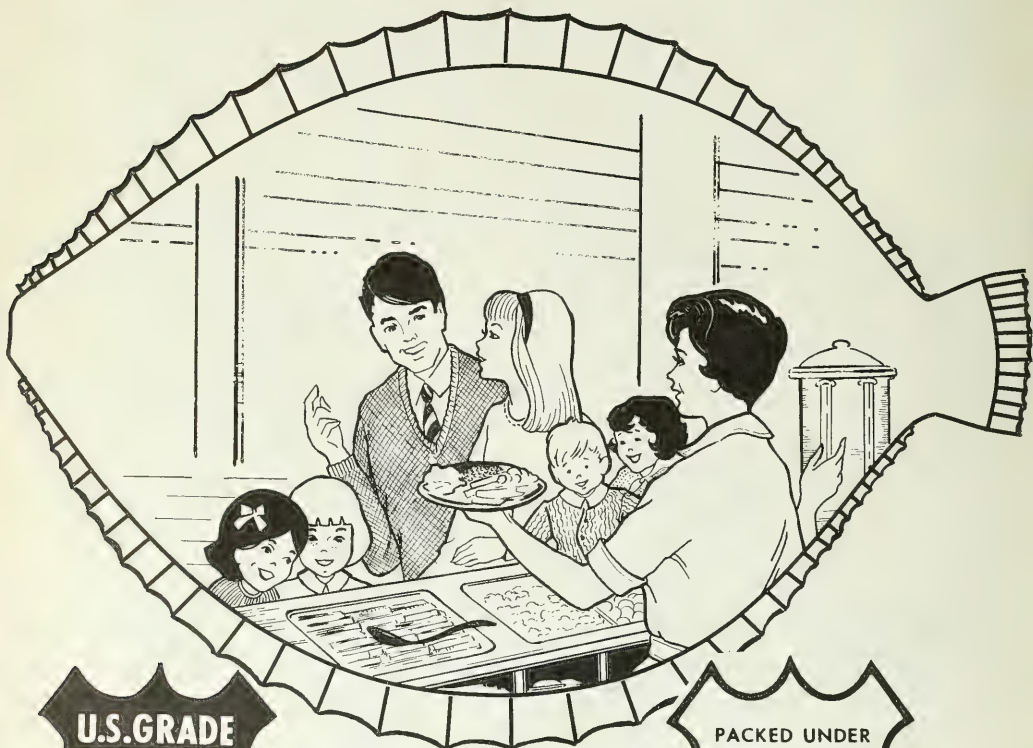
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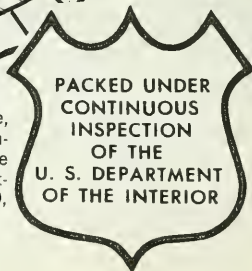
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BUREAU OF COMMERCIAL FISHERIES

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- HIGH NUTRITIONAL VALUE
- DIETETICALLY WELL-BALANCED
- GOVERNMENT INSPECTED PRODUCTS



You may get fishery inspection service, current costs, and detailed information on inspection services by directing a request to the Bureau of Commercial Fisheries, U.S. Department of the Interior, Washington, D.C. 20240.

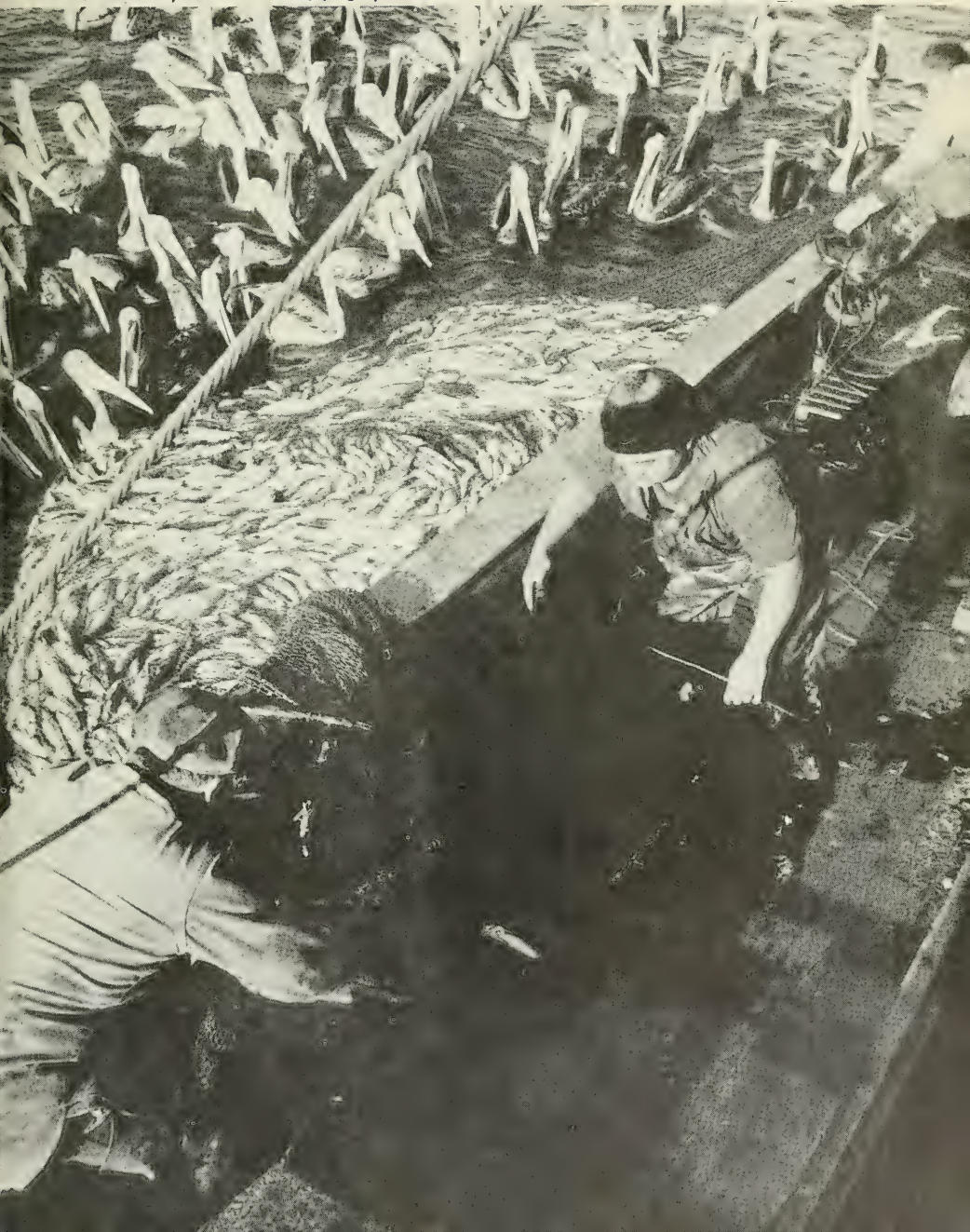


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COVER: Patient pelicans poised to catch any fish that slip through
nets off coast of Valparaiso, Chile. (FAO photo by S. Larrain)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.



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Salmon catch on deck of floating cannery, part of Japanese deep-sea fleet. (Photo: WHO/Nichiro Gyogyo)

UNITED STATES

New England Fleet Sets Outstanding Safety Record in 1966

In 1966, New England's commercial fishing fleet of over 750 documented motor vessels established an outstanding mark in marine safety: Only 5 medium size otter trawlers were lost at sea. The 4,000 fishermen, without loss of life, landed an estimated 700 million pounds of fish and shellfish worth over \$70 million to the fishermen. This record contrasts sharply with 1964's, when 21 vessels and 6 fishermen were lost at sea, and 1965, when the fleet lost 17 vessels and 9 fishermen.

This extraordinary advance in safety may be attributed in part to the increased attention of vessel operators and crew members to safety on shipboard--as evidenced by widespread use of safety equipment and appliances. Also contributing to the record was the efficiency and skill of the First Coast Guard District's Search and Rescue Branch. In 1966, it carried out over 250 assistance missions to the fishing fleet.

Gloucester and New Bedford Lost 2 Each

The ports of Gloucester and New Bedford each lost 2 vessels from their fleet. The sole remaining casualty came from Woods Hole, Massachusetts. The Gloucester fleet lost the "F/V Raymonde" and "F/V Salvatore and Grace" when the first grounded on Cape Cod in January for a total loss and the second foundered off Gloucester in July.

The "F/V Viking," out of New Bedford, sank in Vineyard Sound in October. Her crew was rescued by another New Bedford vessel, the "F/V Matilda S".

Outward bound from New Bedford in August, the "F/V Mary and Joan" caught fire in Vineyard Sound. The vessel was spotted by the crew of a Northeast Airline plane enroute from Nantucket to Boston. The pilot sighted another fishing vessel, the "F/V Charles S. Ashley," alerted and guided it to the blazing craft, and kept circling overhead until the crew had been rescued.

New England Fishing Vessels Lost in 1965		
New Bedford	Gloucester	Portland
Anastasia E. Black Hawk Conquest Glen & Maria Portugal Ruth & Nancy Susie O. Carver The Schalls	Eva II Josephine & Margaret Nancy & Maria Boston Magellan Olympia	Anna C. Mary Anne Snoopy Chatham Doris B.

The small otter trawler "F/V Little Chief" out of Woods Hole, storm battered and leaking badly, foundered in Vineyard Sound while under Coast Guard escort to shelter. The two-man crew of the dragger was rescued.



Oil Is Another Worry for New England Fishermen

Add oil to the harsh sea and the strong competition from Soviet trawlers as a major problem facing the New England fishermen. The newest problem results from the belief of several U. S. firms that the rich fishing grounds on Georges Bank, off Massachusetts' rocky coast, can be developed into a big oil and gas producing field.

Some fishermen see in the future giant drilling rigs blocking their tows, polluted fishing grounds, and pipelines on the bottom endangering expensive bottom fishing gear.

Several representatives of the fishing industry met recently in Boston with a leading oil wildcatter to talk about the fishermen's fears. The major fears and the wildcatter's attempts to allay them follow:

- Fishermen: The fishing industry strongly opposes any further use of high explosives on the fishing grounds for seismic readings. (Last September's blasts were blamed for killing many fish.)

- Oilman: "Now we can do it electronically. We can do it without killing fish."

- Fishermen: In the future, the density of oil and gas rigs on the grounds might be hazardous to draggers' trawls.

Oilman: "We could agree to locate rigs no closer than 4 miles apart."

- Fishermen: A special chemical mud used as a drilling lubricant might spill over and pollute the water.

Oilman: The mud would be recycled and never be stored in the open. This was done in the Gulf of Mexico.

- Fishermen: A pipeline to the mainland would be hazardous to bottom trawlers.

Oilman: "We would be perfectly willing to have them draw up laws calling for a 6- to 8-foot through for our lines." ("The New York Times," Feb. 26, 1967.)



Industry Plans to Develop Unused Gulf Fish

A Fort Myers, Fla., vessel operator plans to convert one large shrimp vessel to a single-boat purse seiner for thread herring fishing in the eastern Gulf of Mexico. His objective is to furnish raw material to a reduction plant now being built in Boca Grande, Fla.

BCF's Pascagoula, Miss., staff provided technical assistance. The Bureau plans to increase its efforts this year to develop effective harvesting techniques for thread herring and other sardine-like fishes in the Gulf. These fishes are only partially used now but show great potential.



Menhaden Industry Tests Gulf's Bottomfish Potential

A small New Jersey menhaden vessel, converted to a side trawler, has moved to Pascagoula, Miss., to fish the northern Gulf of Mexico for industrial bottomfish. It will fish for 12 months to evaluate the commercial potential of these resources as raw material for fish meal.

The annual production from this area, about 50,000 tons, is used primarily for pet food. The industry was developed partly from information produced by BCF explorations.



Fish Meal Futures Trading Begins on N.Y. Produce Exchange

The New York Produce Exchange opened a market for trading futures contracts in fish meal on March 1. Fish meal is a high-protein, mixed-feed supplement used in broiler and other poultry feed rations.

The Produce Exchange action followed studies begun a year ago with many companies in the fish meal trade in the U. S. and abroad.

What Contract Provides

The futures contract provides for delivery of 100 metric tons of Peruvian or Chilean fish meal to Hamburg, Germany. Cost, insurance, and freight will be paid by the seller and delivered at destination. The meal, to be shipped in standard paper bags, will have the following specifications: 65 percent protein, 10 percent fat, and 10 percent moisture; allowances will be made for slight variations within contract specifications. The market will have 17 trading months into the future, but dealings are to be confined to about 6 active months.

Brochures detailing terms and conditions of the C.I.F. Hamburg Fish Meal Contract can be obtained from Secretary, New York Produce Exchange, 2 Broadway, New York, N. Y. 10004 (Tel. 212-269-3400).



Fishing Vessels Are Required to Use Proper Sound-Producers

Commercial fishing vessels must be equipped with the same type of sound-producing devices used by other motorboats, as the result of amended Federal motorboat regulations that became effective January 1, 1967, reports the U. S. Coast Guard's Boating Safety Branch. Prior to the January 1 amendment, commercial fishermen were permitted to equip motorboats, regardless of class, with any sound-producing device. Now, all recreational and commercial motorboats, except those in certain motorboat races, must carry the proper sound-producers for their particular class.

Class A motorboats are less than 16 feet long. Although not required to have a specific sound-producing device, they must be able to sound the proper signals required by Rules of the Road. The devices required for any other class of motorboat may be used on Class A motorboats.

The Whistles

Motorboats that are at least 16 feet but less than 26 feet long, Class 1, must have a mouth, hand or power-operated whistle. The whistle must produce a blast for 2 or more seconds audible for at least one-half mile.

The whistle for Class 2 motorboats, 26 feet but less than 40 feet long, can be either hand or power operated, but must produce a blast for 2 or more seconds and be audible for at least 1 mile.

The largest class of motorboats, Class 3--boats at least 40 feet but not more than 65 feet long--must be equipped with a power-operated whistle audible for at least 1 mile.



First U. S. Fisheries Exposition Aims to Aid Industry

The first fisheries exposition of its kind in the U. S. will be held in Boston, October 7-14, 1967, in the exhibition area of Suffolk Downs. It will be sponsored by The American Commercial Fish Exposition, Inc., a new firm organized to aid fishing industry--to make fishermen more productive and the industry more profitable.

Seminars and work sessions are being arranged to evaluate problems of detection, catching, marketing, and preparation of fish in relation to basic industry research. Displays of modern fishing equipment from manufacturers around the world will be presented.

To give the display appeal outside the industry, New England's famous seafood restaurants, their chefs, and food processors will be invited to participate.



1966 Imports of Frozen Fish Blocks Declined 3%

U. S. imports of frozen fish blocks in 1966 totaled 206.6 million pounds, down 3.8 percent from the 1965 imports of 214.8 million. Cod accounted for 132 million pounds. Principal shippers were Canada with 47 percent of the total, Iceland 18 percent, Norway 6 percent, and Poland 4.7 percent.



Menhaden Catch Dropped in 1966

The U. S. menhaden catch in 1966 dropped sharply from the 1965 figures in 3 of 4 regions:

States	1966	1965
	(Millions of Pounds)	
Middle Atlantic	17.4	130.2
Chesapeake	266.6	307.9
South Atlantic	211.8	190.5
Gulf Coast	793.6	1,022.4
Total	1,289.4	1,651.0



Pacific Coast Canned Salmon Stocks Are About A Third Above 1966

On January 1, 1967, canners' stocks (sold and unsold) in the United States of Pacific canned salmon totaled 2,991,352 standard cases (48 1-lb. cans)--731,477 cases more than the 2,259,875 standard cases, January 1, 1966.

Of total stocks of 3,982,968 actual cases (cans of $\frac{1}{4}$ -lb., $\frac{1}{2}$ -lb., 1-lb., etc.), red salmon accounted for 1,967,208 cases (808,236 cases were 1-lb. cans, and 774,911 cases were $\frac{1}{2}$ -lb. cans) or 49.4 percent of the total canners' stocks on January 1, 1967; pink salmon was 1,427,496 cases or 35.8 percent (1,060,141 cases were 1-lb. talls). Next came chum (284,646 cases, mostly 1-lb. talls), followed by coho or silver (199,808 cases), and king salmon (103,810 cases). (Division of Statistics and Economics, National Canners Association, Feb. 6, 1967.)



Shrimp Imports Rose 10% in 1966

U. S. imports of all shrimp (fresh, frozen, canned, and dried) in 1966 were 178.5 million pounds--compared to 162.9 million pounds in 1965--an increase of 9.6 percent. Imports from Mexico in 1966 totaled about 68.7 million pounds--compared to 59.9 million pounds in 1965--up 14.6 percent.

In December 1966, shrimp imports (fresh, frozen, canned, and dried) were 17.7 million pounds--compared to 15.2 million pounds in December 1965. Fresh or frozen heads-off shrimp (shells-on) amounted to about 13 million pounds; peeled and deveined, about 3.5 million pounds; frozen breaded (raw or cooked) 86,258 pounds; and other types^{1/} of shrimp products (some dried and canned) about 1.2 million pounds.

Mexico shipped about 8 million pounds during December 1966, compared to 6.1 million pounds in December 1965; about 6.3 million pounds of fresh or frozen heads-off

shrimp (shells-on); peeled and deveined, 1.5 million pounds; frozen breaded (raw or cooked) 86,258 pounds; dried, 1,850 pounds; and other types of shrimp products, 61,626 pounds. ^{1/}Imports of "other types" of shrimp consisted of peeled in airtight containers or canned (145,622 pounds); cooked but not breaded (68,250 pounds); dried (59,138 pounds); and others not specified (892,903 pounds).



January 1967 Wholesale Prices and Indexes for Edibles

Seasonally light supplies of fresh fish and shellfish at higher prices resulted in a 3-percent rise from December 1966 to January 1967 in the wholesale price index for edible fishery products (fresh, frozen, and canned). At 129.1 percent of the 1957-59 average, the overall index was 3.7 percent higher than January 1966.

The subgroup index for drawn, dressed, or whole finfish rose 10 percent from Decem-

Wholesale Average Prices and Indexes for Edible Fish and Shellfish, January 1967 with Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices ^{1/} (\$)		Indexes (1957-59=100)			
			Jan. 1967	Dec. 1966	Jan. 1967	Dec. 1966	Nov. 1966	Jan. 1966
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					129.1	125.3	125.0	124.5
Fresh & Frozen Fishery Products:					133.2	126.7	126.5	127.7
Drawn, Dressed, or Whole Finfish:					136.1	123.7	121.0	138.3
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.22	.15	172.3	117.1	115.2	187.4
Hallbut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.48	.48	142.0	142.0	142.0	141.0
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	2/88	.88	2/122.2	122.2	120.2	122.3
Whitefish, L. Superior, drawn, fresh	Chicago	lb.	.75	.71	111.2	105.2	93.3	93.3
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.70	.69	114.6	112.9	106.4	122.8
Processed, Fresh (Fish & Shellfish):					133.9	125.7	127.6	128.3
Fillets, haddock, sm., skins on, 20-lb. tins	Boston	lb.	.53	.40	127.6	97.2	114.2	105.7
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	1.14	1.07	139.6	125.4	120.1	116.0
Oysters, shucked, standards	Norfolk	gal.	8.00	7.75	134.9	130.7	139.1	147.6
Processed, Frozen (Fish & Shellfish):					124.2	124.9	125.1	111.9
Fillets: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.45	.45	114.0	114.0	110.2	101.4
Haddock, sm., skins on, 1-lb. pkg.	Boston	lb.	.38	.39	111.4	114.3	117.3	115.8
Ocean perch, lge., skins on 1-lb. pkg.	Boston	lb.	.30	.31	103.5	108.7	103.5	112.2
Shrimp, lge. (26-30 count), brown, 5-lb. pkg.	Chicago	lb.	1.11	1.11	131.6	131.0	131.0	110.3
Canned Fishery Products:					122.5	122.5	122.9	119.3
Salmon, pink, No. 1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	27.00	27.00	117.7	117.7	119.9	122.0
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	13.08	13.08	116.1	116.1	115.0	111.0
Mackerel, jack, Calif., No. 1 tall (15 oz.), 48 cans/cs.	Los Angeles	cs.	8.50	8.50	144.1	144.1	144.1	120.9
Sardines, Maine, keyless oil, 1/4 drawn (3-3/4 oz.), 100 cans/cs.	New York	cs.	11.25	11.25	144.3	144.3	144.3	131.5

^{1/}Represent average prices for one day (Monday or Tuesday) during week in which 15th of month occurs. Prices are published as indicators of movement, not necessarily absolute level. See daily Market News Service "Fishery Products Reports" for actual prices.

Source: U. S. Department of Labor, Bureau of Labor Statistics.

ber to January because of substantially higher prices for nearly all items. At Boston, prices for exvessel large haddock were sharply higher (up 47.1 percent) as a result of very light landings. Prices were up for Lake Superior fresh whitefish at Chicago by 5.7 percent, and for Great Lakes round yellow pike at New York City by 1.5 percent. Although January 1967 prices were considerably higher than January 1966 for whitefish (up 19.2 percent) and slightly higher for frozen western halibut (up 0.7 percent), these were offset by lower prices for haddock (down 8.1 percent). The latter were solely responsible for a 1.6-percent subgroup index decline from January 1966.

Sharply higher prices in January 1967 for fresh haddock fillets, up 31.3 percent from December 1966, were largely responsible for a 6.5 percent rise in the subgroup index for fresh processed fish and shellfish. Haddock landings were light and the supply available for filleting small. Prices at New York City for South Atlantic fresh shrimp rose 6.5 percent from December 1966 to January 1967, and standard shucked oysters at Norfolk were up 3.2 percent. Compared with January 1966, the subgroup index in January 1967 was 4.4 percent higher. Prices rose 20.7 percent for haddock fillets and 15.2 percent for shrimp. January 1967 prices for standard shucked oysters were down 8.6 percent from January 1966.

The subgroup index for frozen processed fish and shellfish dropped 0.6 percent from December 1966 to January 1967. An upward trend in prices at Chicago for frozen shrimp was more than offset by lower prices at Boston for frozen ocean perch (down 4.8 percent) and haddock fillets (down 2.5 percent). Compared with January 1966, the subgroup index in January 1967 rose 11 percent because of much higher prices for shrimp (up 19.3 percent) and flounder fillets (up 12.4 percent). But January 1967 prices were lower for ocean perch (down 7.8 percent) and haddock fillets (down 3.8 percent) than in January 1966.

Prices for all canned fishery products listed in the index were unchanged from December to January. Market conditions appeared relatively steady. There were good supplies of some canned fish items for Lenten demand. Canned salmon is especially plentiful. But compared with January 1966, the index this January was up 2.7 percent. Prices were lower than in January 1966 for canned pink salmon but sharply higher for

California jack mackerel (up 19.2 percent) and canned Maine sardines (up 9.7 percent). (BCF Fishery Market News.)



Oceanography

"ALUMINAUT" CONDUCTS UNDERSEA SURVEYS OFF FLORIDA

Experimental dives by the deep-sea research submarine "Aluminaut" off Florida in January show the capability of such craft to perform undersea oceanographic surveys effectively, reports the U. S. Naval Oceanographic Office. The Aluminaut is owned by Reynolds Submarine Services. Five dives were performed, each 10 hours long, to 1,000 feet. Scientists from the Naval Electronics Laboratory and Lamont Geological Observatory conducted experiments on sediments and currents at the bottom.

The first dive was made to reconnoiter a selected area off the Florida coast. The second was made to the bottom at 1,000 feet. While cruising for 6 hours at 10 feet off the bottom, a photographic and visual reconnaissance was conducted up slope to 100 feet. Visibility was excellent in deep water, limited only by the artificial lights used, but dropped to about 25 feet near shore. The Aluminaut, which has wheels, actually rode along the bottom during much of this dive.

During the third, the vessel rested on the bottom. Steel balls of known weight and diameter were dropped at given distances to the bottom, clouding the waters near the ocean's floor. The amount of visibility obstructed by the disturbance of the ocean bottom is an important problem facing the Navy in its program for rescuing sailors from sunken subs using rescue vehicles. Current studies with dye markers were used to investigate ocean dynamics. Dive four investigated the maximum visual and acoustic ranges to a variety of bottom markers. The last dive evaluated the vessel's characteristics while operating at depth.

NAVY STUDIES WAYS OF RECOVERING TESTING DEVICES

As part of a program to avoid loss of valuable underwater testing devices, the U. S.

Naval Oceanographic Office recently conducted tests adjacent to the Bahama Islands.

From the research vessel "USS Little-hales," engineers from the Instrumentation Center experimented with recovery methods for several costly devices used in oceanographic work. The first was a flotation system to recover an acoustic transducer usually towed behind a ship at depth of about 100 feet. (This distance is necessary to avoid interference from normal ship's noises.)

Costing nearly \$30,000 each, these sonar devices are packaged in a streamlined 9-foot "fish." The recovery apparatus is 2 rubber flotation bags released automatically when the towing gear parts. To aid in recovery, a signal light flashes on and a pinger is actuated. An existing requirement is that all recovery systems function instantly to prevent the 2,000 pound instrumentation housing from plummeting to depths near 500 feet. At such pressures, outside forces would prevent inflation of the recovery bags.

Test Gas That Helped Recover H-Bomb

The Navy also tested a "Monopropellant Gas Generator" designed to inflate the flotation bags under great pressures. Hydrazine gas, used to help recover the H-bomb lost off the shores of Palomares, Spain, was used. This generator would be effective to depths of 20,000 feet.

An expendable bathythermograph (BT) was tested to see if a body in free fall in ocean waters falls at a constant rate. An expendable BT is an electronic instrument of about 1½ pounds that allows a temperature profile to be made at speeds up to 30 knots in any sea state. Other special use BTs were tested.

Also tested was a Precision Fathometer Recorder, an electronic device designed to provide the oceanographer with a bottom profile.

* * *

ROUND-THE-WORLD MAGNETIC SURVEY FLIGHT UNDERWAY

The U. S. Naval Oceanographic Office is conducting an airborne geomagnetic survey of all accessible ocean areas of the world. It is called "Project Magnet." Geomagnetic data are used to prepare navigational and world isomagnetic charts, which provide more re-

liable navigational data to ships and aircraft of all nations.

A new round-the-world flight began in February and will involve about 14 countries in 40 days. Information gathered will be distributed to all nations through the International World Data Center.

* * *

NAVIGATIONAL FIELD SURVEY OF PACIFIC COAST AND HAWAII SCHEDULED

The Coast and Geodetic Survey (CGS) has announced that a field inspection will be made this year of navigational facilities and conditions on the coasts of California, Oregon, Washington, and Hawaii.

The findings will be incorporated in a new edition of U. S. Coast Pilot 7, one of a series of nautical books that supplies information important to navigators of U. S. coastal and intracoastal waters. Generally, the books furnish in narrative form information that cannot be shown graphically on marine charts--navigation regulations, weather, ice, freshets, routes, and port facilities.

CGS will consult with Federal agencies, port authorities, pilots, and other marine interests. Similar information about the Hawaiian Islands will be obtained during an 8-week inspection tour later this year.

A new edition of each Coast Pilot is published at intervals of 4 to 10 years. Yearly supplements bring information up to date. The information is considered vital for safe navigation, and Coast Pilots are consulted regularly by skippers of naval and commercial craft and small boat operators.

Coastal areas covered by Coast Pilot 7 will include: San Diego to Point Arguello, Calif.; Channel Islands, Calif.; Point Arguello to San Francisco Bay; San Francisco Bay; San Francisco Bay to Point St. George, Calif.; Chetco River to Columbia River, Ore.; Columbia River, Oregon and Washington; Columbia River to Strait of Juan de Fuca, Wash.; Straits of Juan de Fuca and Georgia, Wash.; Puget Sound, Wash.; and Hawaii.



STATES

Alaska

GOVERNOR URGES FISHING GEAR LIMITS

Governor Walter J. Hickel of Alaska has called for the limitation of gear in the salmon and king crab fishing industries. In a message to the Association of Pacific Fisheries, Hickel said the trend toward more and more gear, if not reversed, ultimately will damage both fisheries.

He emphasized: "From 1960 to 1966 there has been an increase of about 100 percent in the number of vessels and gill nets and almost 300 percent in the number of set nets in Bristol Bay. This increase came in the face of an outlook for poor runs in 1962, 1963, and 1964. This trend must be arrested and reversed, otherwise the fish harvest will be an economic farce, even if the runs are strong."

Hickel said the buildup of the king crab industry in the Kodiak area shows that the fishery is at or near the level of maximum sustainable yield. Any further increase in harvesting capacity could have serious repercussions, including curtailment of fishing time and a drop in efficiency.

* * *

KING CRAB LANDINGS IN 1966 SET RECORD

Alaska king crab landings totaled 159 million pounds in 1966--an increase of 27 million pounds, or 21 percent, over 1965's 132 million pounds. The value of the 1966 catch to the fishermen was about \$16 million.



Michigan

SEEKS TO BALANCE FISHING DEMANDS WITH LIMITED STOCKS

The Conservation Commission has endorsed in principle a plan to regulate commercial fishing in Michigan's Great Lakes waters by presetting harvest areas and quotas and, when and where necessary, issuing individual fishing permits.

The new approach to balancing commercial fishing demands with limited fish stocks, particularly high-value species, departs markedly from the present system of licensing that allows unlimited entry into the sagging Great Lakes industry.

Fisheries officials stress that the proposed new control system is absolutely necessary to help put the industry back on its feet. The plan, which requires enabling legislation, would be tested first on the lake trout fishery of Lake Superior. When enough experience is gained there, the program could be refined and extended to other species of fish and other areas of the Great Lakes.

To guide the fishery in the best interests of all, the Conservation Department will encourage the establishment of advisory committees representing commercial operators, sport fishermen, and the general public.

Some Fishermen Object

To meet some objections, the Department changed that part of its proposed plan that would have regulated most commercial fishing under contracts awarded through competitive bidding. Commercial fishing interests argued that it would force too many out of business and discriminate in favor of big operators who would have a decisive edge in making top bids for contracts.

The Department conceded that its plan would restrict participation in the commercial fishing industry. But, it pointed out, operators issued permits would stand a much better chance of making good returns for their efforts than is true now. Under the present setup of wide-open entry in the industry, there are too many fishermen for the supplies of quality fish stocks.

* * *

BUILDS VESSEL FOR GREAT LAKES RESEARCH

The State of Michigan's Conservation Department is building a vessel to carry out intensive fisheries studies in the Great Lakes.

The 60-foot steel craft, under construction at Escanaba, Mich., will be powered by

Michigan (Contd.):

twin diesel engines and rigged with the latest fish-finding and navigational equipment, including hydraulically operated netting gear, radar, and sonar. It will be manned by the Conservation Department to give its fisheries biologists accurate, up-to-date information on Great Lakes fish stocks needed to manage sport and commercial fishing for top allowable returns.

The vessel's research work first will emphasize salmon and trout populations in Lake Superior and Michigan. The vessel's home port has not been selected yet, but plans call for it to be in northern Lake Michigan. (Michigan Department of Conservation, Feb. 2, 1967.)



Mississippi

CATFISH PRODUCTION INCREASES

There are 4,500 acres of farm ponds under catfish production in southeast Mississippi. Within 2 years, 12,000 more acres will be completed. Near Yazoo City, one company is building 1,600 acres of catfish ponds, processing plant, fish meal plant, and feed mill. The capital investment is over \$4 million. Production is expected to begin within 18 months. BCF is providing technical assistance in harvesting techniques.



Texas

SHRIMP THREATENED BY DESTRUCTION OF ESTUARIES

A report of the Texas Parks and Wildlife Department to the Governor and legislature paints a discouraging picture of the shrimp fishery's future. The report states that "the

continuation of the present trend toward bulkheaded shorelines would result in diminishing shrimp production."

Here are some excerpts: "The life of the shrimp is short, and the period spent in the bays is only two or three months in duration for each successive overlapping swarm. There may be five or six such swarms during the warmer months. This brief but vital period in the bay nursery areas has become the weakest link in the life cycle of the shrimp. It is on this weak link that the future of the shrimp industry must depend.

"The crisis that has arisen is the accelerated disturbance and destruction of the estuarine nursery areas along the Texas coast. While such submerged land areas are public lands belonging to the State of Texas, they are unprotected by state regulation and are open to any and all types of man-made modification. . . .

"Rapid development of the coastal region in both industrial and residential expansion has brought piecemeal channel dredging, filling and spoiling throughout the bay systems without overall design or plan. The combined effect of such modification is great."

The report cites a recent BCF study in the Galveston Bay area comparing shrimp production along two similar shorelines--but one had been modified by construction of a dredge-fill bulkhead. Intensive sampling for 10 months produced 2.5 times more brown shrimp and 14 times more white shrimp along the natural shore than along the bulkheaded shore.

The report makes clear what is at stake: "The shrimp fishery is this nation's most valuable commercial fishery, and that of Texas is today the largest of any state. Dockside value to the fisherman amounts to about \$35,000,000 per year."



BUREAU OF COMMERCIAL FISHERIES PROGRAMS

Invertebrates in New England Marine Waters May Have Value

A summary of benthic (sea bottom) fauna data from an Atlantic Continental Shelf and Slope study by BCF's Biological Laboratory at Woods Hole, Mass., shows interesting relationships between the density of different groups of animals and the type of bottom sediments they inhabit.

Sea scallops (*Placopecten*) and lobsters (*Homarus*) are the only benthic invertebrates now being fished in offshore waters. It may become economically worthwhile in the future to use other benthic species for human food, animal food, fertilizer, etc. The large standing crop of invertebrates in New England marine waters grows rapidly--and so may have a useful potential.



Seattle Lab Studies Gray Whales

The BCF Marine Mammal Biological Laboratory in Seattle, Wash., was authorized to take 40 (later increased to 60) gray whales in 1966 to obtain data on the reproductive cycle and other biologic features of the gray whale. The data are essential to any further use of the species. The 1967 quota is 100 whales.



BCF's "Undaunted" Cooperates in Fishery Research

For several years BCF's "Undaunted," "Geronimo," and "Oregon" cooperated with the UN Caribbean Fishery Development Project by providing space for trainees from underdeveloped nations during Caribbean operations. The Development Project recently acquired the 82-foot multipurpose "Calamar," based in Barbados.

Now the Calamar and Undaunted are cooperating southeast of Barbados in tuna explorations--the former using longline gear and the latter bait fishing and conducting oceanographic studies. Their scientists will compare results.



"Oregon II" is Christened

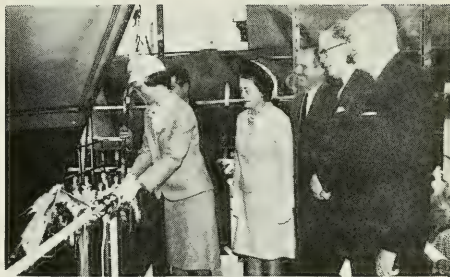


Fig. 1 - Mrs. Harvey R. Bullis Jr., wife of the Base Director, Exploratory Fishing and Gear Research Base, Pascagoula, Miss., breaks a bottle of champagne on the bow of the BCF research vessel Oregon II during christening on February 4 in Pascagoula. At extreme right is Seton Thompson, BCF's Regional Director in St. Petersburg, Fla.

The 170-foot craft is being constructed by the Ingalls Shipbuilding Division of Litton Industries. Scheduled for completion in May, it will be assigned to the Pascagoula Base and become operational after July. It will be used to develop the fisheries of the Gulf of Mexico and Tropical Atlantic.



Fig. 2 - The R/V Oregon II slides down the ways into the "Singing River" following christening. (Photos: Ingalls)



"Oregon" Reports Red Snappers Off Honduras

The recent cruise of BCF's "Oregon" revealed a high catch potential of red snapper off British Honduras. As a result, several U. S. commercial vessels plan to fish experimentally in that area. The first of the fleet was scheduled to sail in mid-February.

If this fishery were developed, it would parallel the one now occurring off Nicaragua. There, about 25 U. S. vessels are fishing successfully for snapper stocks discovered by the Oregon.



BCF and Navy Conduct Oceanographic Explorations

BCF's Gloucester (Mass.) based exploratory vessel "Delaware" is conducting tuna and swordfish explorations in the western North Atlantic during March. The Navy's Oceanographic Prediction Office is taking part in the explorations by providing expendable bathythermograph probes for determining subsurface temperature gradients.

Using these instruments will enable BCF to evaluate the expendable bathythermograph system for use on fishing vessels--and provide the Navy with wanted oceanographic data.



Trade Fairs Sell Calico Scallops

The display and promotion of North Carolina calico scallops by BCF's Office of International Trade Promotion at Paris and Milan trade fairs prompted one of the largest U. S. fishery firms to order 30,000 pounds for export. The manager of the firm's international division has recommended that calico scallops be added to the firm's domestic line.

At the London Frozen Food Exhibit, February 14-23, both breaded and plain calico scallops, individually frozen by a liquid nitrogen process, were displayed.

BCF's exploratory fishing operations along the South Atlantic coast have outlined the boundaries of vast resources of calico scallops. It is expected that the opening of export markets would lead to fuller use of these resources--and aid the overall economic growth of the Southeast Coastal States.



U. S. Fishery Products To Be Shown in Frankfurt

Fishery products produced or processed in the U. S. will be among food items displayed and promoted at the United States Trade Center in Frankfurt, Germany, April 5-14. Frankfurt will be the 11th overseas trade fair in which BCF has participated in cooperation with the U. S. Department of Agriculture.

More information is available from: Office of International Trade Promotion, Bureau of Commercial Fisheries, Room 606, Lynn Building, 111-19th St. N., Arlington, Va. 22209.



FEDERAL ACTIONS

Atomic Energy Commission

ADVANCES FOOD IRRADIATION PROGRAM

Irradiated meat that needs no refrigeration will be produced in commercial quantities under a contract with the Atomic Energy Commission (AEC). The AEC asked for bids before April 17, 1967, on a plant that would produce a million pounds of meat a year for three years.

The U. S. Army, which has a prime interest in the plant, has promised to buy 300,000 pounds of meat a year. Irradiated bacon and potatoes already have been used by the Army in small quantities overseas.

The purpose of the program is to demonstrate the feasibility of large-scale processing of foods at competitive cost. The AEC is putting up \$140,000 for engineering design and \$230,000 for radiation sources. The contractor will pay for the plant.

The Food and Drug Administration already has approved irradiated bacon, white potatoes, wheat and wheat flour for commercial use. The AEC hopes that ham and other pork will be approved in 1967, followed in 1968 by chicken, beef, shrimp, and pork sausage. ("Science News," Dec. 31, 1966.)



Food and Drug Administration

CANNED TUNA NOW INCLUDES BLACKFIN

An amendment to the standard of identity for canned tuna (21 CFR 37.1) to include blackfin tuna in the class of fish known as tuna will become effective March 1, 1967.



Economic Development Administration

FUNDS ASSURE PACIFIC HAKE FISHERY

Funds approved by the Economic Development Administration, Department of Commerce, will be used to develop further the Pacific hake fishery out of Aberdeen, Washington. The funds were requested by the Grays Harbor Regional Planning Commission.

BCF's Exploratory Fishing Base in Seattle will provide technical supervision and

equipment. It will arrange the charter of commercial fishing vessels in test fishing for hake. The use of these vessels may accelerate the development of a domestic fishery.

PROJECT COULD AID COASTAL CLAM FLATS

A \$221,300 grant by the Economic Development Administration (EDA) will help build a sewer system in Waldoboro, Maine, that ultimately will serve over 200 acres of industrial and commercial land. The system also will stop pollution of the area's streams and coastal waters.

The State of Maine Water Improvement Commission states that these waste-treatment facilities will make possible the reopening of coastal clam flats closed 3 years ago because of pollution. This would provide jobs for 100 full-time and 100 part-time clam diggers.

The system will cost \$621,800. Besides EDA financing, Interior Department's Federal Water Pollution Control Administration is granting \$89,640. Local revenue bonds and a State of Maine grant provide the remaining \$310,860.

STUDY OF FISH REDUCTION PROCESS APPROVED

A project to evaluate an experimental fish reduction process applicable to small fishery industries has been approved by the Economic Development Administration (EDA) of the Commerce Department. The project was submitted by BCF's Regional Office in Ann Arbor, Mich. EDA will provide \$148,600 and BCF \$39,400 in services and equipment.

The study will determine and make available to the fishing industry information on: (1) the market potential of experimental processed wholefish product (press-cake) that can be used safely in animal diets, particularly mink; (2) the engineering aspects of producing press-cake; (3) the economics of producing it--including utilization of byproducts.

BCF's Branches of Technology, Marketing and Economic Research will jointly carry out the study.



INTERNATIONAL

U.S. and USSR Agree on Fishing Pact

On February 6, 1967, in Washington, representatives of the United States and the Soviet Union reached agreement on the king crab fishery in the eastern Bering Sea and on several matters affecting their fisheries off the U. S. Pacific Coast.

They reviewed some fishery problems off the U. S. Atlantic Coast and decided to consider them further in late May--just before the annual meeting of the International Commission for the Northwest Atlantic Fisheries.

The U. S. and USSR extended for another 2 years their agreement on king crab fishing on the U. S. Continental Shelf in the eastern Bering Sea. The Soviet quota was reduced from 118,600 cases of canned crab to 100,000 cases.

Soviet Vessels Restricted in Some Ways

A separate 1-year agreement specifies several areas seaward of 12 miles from the Oregon-Washington coast in which Soviet vessels would either refrain from fishing or from concentrating their efforts. In other areas off the Oregon-Washington coast, the 2 nations would take measures, jointly and separately, to protect stocks of fish. Additional protection would be provided for the fishing gear of U. S. halibut fishermen near Kodiak Island, Alaska, in the halibut season. Soviet vessels would transfer cargoes in several designated areas off Washington and Oregon, and off Alaska in the nine-mile zone touching the U. S. territorial sea. Soviet vessels also would continue to fish within the 9-mile zone for the agreement's duration in 2 areas of the central and western Aleutians, and in a smaller area of the northern Gulf of Alaska.

The agreement also provides for cooperation in scientific research, exchange of scientific data and personnel, exchanges of fishermen or their representatives aboard vessels of the two countries, and procedures for reducing conflicts between vessels and gear.

The U. S. delegation at the talks leading to the agreement was headed by Ambassador Donald L. McKernan, Special Assistant for Fisheries and Wildlife to the Secretary of State. The 6-man Soviet delegation was headed by Deputy Minister of Fisheries Mikhail N. Sukhoruchenko. Ambassador McKernan was assisted by advisors from Federal and state fishery agencies, and from sport and commercial fisheries of Alaska, Washington, Oregon, California, Rhode Island, New York, and New Jersey. (Department of State, Wash., D. C., Feb. 6, 1967.)



International Pacific Halibut Commission

PROPOSES 1967 HALIBUT REGULATIONS

The International Pacific Halibut Commission (IPHC) ended its 43rd annual meeting in Seattle, Wash., February 3, 1967. A Convention between the U. S. and Canada authorizes IPHC to investigate and regulate the halibut fishery of the Northern Pacific Ocean and Bering Sea.

IPHC expressed concern to the 2 governments about the effect of increased trawling for other species on the large population of small halibut in southeastern Bering Sea. This area has been set aside as a nursery. All fishing for halibut there has been prohibited in the proposed regulations for 1967.

Scientific findings and conferences with industry impelled the Commission to recommend to the 2 governments these regulations for the 1967 fishing season:

- (1) The regulatory areas shall be: Area 2--All convention waters south of Cape Spencer, Alaska. (Area 1 has been combined with 2.) 3A--between Cape Spencer and Shumagin Islands. 3B--Shumagin Islands to Atka Island, excluding Bering Sea. 3C--west of Atka Island, excluding Bering Sea. 4A--the Bering Sea edge--Unimak Pass to Pribilof Islands. 4B--Fox Islands grounds, Bering Sea. 4C--

edge grounds and Bering Sea side of Aleutian Chain between 170° W. and 175° W. 4D--Bering Sea east of 175° W. and north of a line between Cape Newenham and St. Paul Island and waters west of 175° W. (The flats in southeastern Bering Sea east of Area 4A and south of a line between Pribilof Islands and Cape Newenham have been declared a nursery and closed to halibut fishing.)

(2) Opening and closing hours of regulatory areas shall be 6 p.m., Pacific Standard Time, of date indicated. Exceptions: Area 3C, 4A, 4B, 4C, and 4D where they shall be open at 3 p.m. and close at 6 p.m., local time.

(3) Area 2 shall open May 9 and close when catch limit of 23 million pounds is reached--or on October 15, whichever is earlier.

(4) Area 3A shall open May 9 and close when catch limit of 33 million pounds is reached--or on October 15, whichever is earlier.

(5) Area 3B shall open May 9 and close when catch limit of 3.5 million pounds is reached--or on November 15, whichever is earlier.

(6) Area 3C, west of Atka Island excluding Bering Sea, shall open March 29 and close November 15.

(7) Area 4A--the Bering Sea edge, Unimak Pass to Pribilof Islands--shall open April 3 and close April 17.

(8) Area 4B--Fox Islands grounds, Bering Sea--shall open September 1 and close September 10.

(9) Area 4C--edge grounds between Pribilof Islands and 175° W.--shall open March 29 and close April 22.

(10) Area 4D--east of 175° W. and north of a line between St. Paul Island and Cape Newenham and waters of Bering Sea west of 175° W.--shall open March 29 and close November 15.

The Commission will provide 10 days' notice of closure of Area 2; 18 days' notice of closure of Area 3A; and at least 18 days' notice for Area 3B in 1967.

The next annual meeting will be held in Seattle, Wash., beginning January 23, 1968.

Martin K. Eriksen of Prince Rupert, British Columbia, was elected Chairman, and Harold E. Crowther, Acting Director, BCF, Vice Chairman, for the ensuing year.



International Northwest Pacific Fisheries Commission

JAPAN-SOVIET TALKS START MARCH 1

The 11th annual meeting of the Japan-Soviet Northwest Pacific Fisheries Commission meets in Tokyo March 1 to decide 1967 catch quotas for salmon and crab in north-west Pacific waters covered by the 1956 Japan-Soviet North Pacific Fishery Convention. Measures for fishing operations also will be discussed.

The negotiations are held alternately in Tokyo and Moscow.

Since a bumper year for pink salmon is expected, the Japanese plan to secure a catch quota of 115,000 metric tons--the same as 1965, the previous bumper year.

Japan's 1966 quota was 96,000 tons, a lean year for salmon.

Soviet Firmness Expected

The Soviets are expected to be firm and make new demands. The 1956 treaty expired at the end of 1966 and talks to revise it will be held concurrently with regular fishery negotiations.

Observers expect hard negotiations to decide the 2-year catch quotas for king crabs.

The Soviet Union, signatory to the Continental Shelf Treaty, may have to restrict its crab fishing operations in the Bristol Bay area. Therefore, observers believe she will demand a higher catch in waters covered by the Japan-Soviet Fishery Convention. The Soviet quota last season was 420,000 cases, and Japan's 240,000 cases. (Each case contains 48 half-pound cans.)

South Korea May Enter Waters

Observers believe South Korea's planned advance into waters covered by the Japan-

Soviet Treaty will be another problem discussed.

Government sources expect the Soviets to demand that part of Japan's catch quota be allocated to South Korea if she is allowed to fish in the restricted waters because the USSR does not recognize the Republic of Korea. However, the Japanese are expected to state that they do not plan to help South Korea advance into the fishery grounds.

The area covered by the fishery treaty embraces a wide expanse of water west of 175° W. longitude. The restricted waters were expanded in 1962--and the fishing zones divided into zone "A" and zone "B."

Fishing fleets headed by motherships are allowed to operate in zone "A," covering the area north of 45° north latitude; small fishing vessels operate in zone "B" waters south of 45° north latitude. ("The Japan Times," Jan. 5, 1967.)



Norway May Keep Some Fishing Rights in Greenland

Norway may retain some fishing rights in East Greenland, although they will probably be of little value because the area has few fishery resources. Norway gained limited hunting and fishing rights in East Greenland under a 1924 agreement with Denmark, which controls the island. The agreement expires June 1967. Denmark is reported to have negotiated a compromise continuing Norway's limited fishing rights. (U. S. Embassy, Copenhagen.)



Marine Oils

DECLINE IN 1967 WORLD PRODUCTION FORECAST

A U. S. Department of Agriculture publication forecasts a slight decline in world production of marine oils in 1967 because of

Estimated World Production of Marine Oils, Average 1955-59, Annual 1960-66 and Forecast 1967

Commodity	Forecast 1967	1/1966	1965	1964	1963	1962	1961	1960	Average 1955-59
..... (1,000 Short Tons)									
Marine oils:									
Whale	155	175	218	249	295	390	428	418	427
Sperm whale	175	170	170	165	149	130	120	122	119
Fish (including liver)	940	935	875	836	684	734	662	512	427
Total	1,270	1,280	1,263	1,250	1,128	1,254	1,210	1,052	973

1/ Preliminary.

Sources: "World Agricultural Production and Trade (Statistical Report), January 1967," Foreign Agricultural Service, U.S. Department of Agriculture, Washington, D. C.

Law of the Sea

BRAZIL MAY RATIFY 1958 CONVENTIONS

The four 1958 Geneva Law of Sea Conventions (on the High Seas, Continental Shelf, Fisheries, and Territorial Sea) are scheduled to be presented to the Brazilian Congress for consideration when the Costa e Silva administration takes over in March. Ratification probably will follow within 3 or 4 months with Brazil entering certain reservations on the Continental Shelf Convention--like those made by other ratifying countries. (U. S. Embassy, Rio de Janeiro, Jan. 19, 1967.)



a further cutback in the Antarctic baleen whale oil quota. The chief factor will be a drop in Japanese production. Sperm oil production likely will be fractionally larger. Increased output by the Soviet Union and the Republic of South Africa is expected to be offset largely by further declines for Japan, Norway, and Peru.

Fish oil production, which set a record in 1966, probably will continue its upward trend in 1967. With record supplies available in 1966, fish oil prices were down sharply.



Norway and USSR Continue Joint Fishery Research Projects

Norwegian newspapers report that joint Norwegian-Soviet research projects will continue in 1967. They were scheduled to begin with a study of capelin resources in the Barents Sea in January-March 1967 by the Norwegian vessel "G. O. Sars" working closely with the Soviet Polar Institute for Marine Fisheries and Oceanography (PINRO).

Norway increased its capelin catch appreciably in 1966. Soviet interest in capelin probably is related to reported Soviet plans to build a fish meal and oil factory near Murmansk--that area's first.

Norwegian concern about possible overfishing in the Northeast Atlantic may be stimulating their research efforts. A newspaper reports that the 1966 Norwegian-Soviet-British research project in the Northeast Atlantic will be continued in 1967. This work includes efforts to assess stocks of cod, herring, and ocean perch in the Norwegian Sea and other areas. The Norwegian research vessels G. O. Sars and "Johan Hjort" will take part in this project in August-September 1967.

Sealing Commission Met in Moscow

The Norwegian-Soviet Sealing Commission met in Moscow, December 15-17, 1966, and heard reports on their sealing catches and scientific investigations of stock in the Northeast Atlantic. The Commission agreed to increase cooperation to attain a rational exploitation of seal resources. The next meeting will be held in Oslo in November-December 1967.

One joint research project involves a study of the Greenland seal by a Norwegian sealing vessel manned by Norwegian and Soviet scientists. (U. S. Embassy, Oslo, Dec. 24, 1966, and Jan. 15, 1967; U. S. Embassy, Copenhagen, Jan. 10, 1967, and other sources.)



Joint Expedition Planned by Brazil and Norway

A joint Norwegian-Brazilian ocean research expedition is planned for the second half of 1967, according to the Norwegian periodical "Bergens Tidende." The expedition vessel "Professor W. Besnard" is being built at a Bergen shipyard for the Oceanographic Institute in Sao Paulo, Brazil. The vessel, Brazil's first for modern ocean research, will be fitted with Norwegian research equipment. NORAIID, the Norwegian governmental foreign aid agency, has appropriated 150,000 kroner (US\$21,000) for special equipment for the expedition.

The expedition also will serve as a training program for Brazilian scientists and crew members. The Norwegian participants will include 6 ocean research scientists and 3 senior members of the crew, including the skipper. (U. S. Embassy, Oslo, Dec. 24, 1966.)



USSR Plans 1968 International Fisheries Fair

The Soviet Union's Ministry of Fisheries plans to organize an international fisheries fair in Leningrad for summer 1968. The fair (Inrybprom 68) will exhibit Soviet fishing equipment, processing equipment, fishing techniques, research developments, etc. The Soviets expect many foreign firms to participate. Special attention will be paid to the development of the Soviet fishing fleets with exhibitions of many types of vessels and shipboard advances in mechanization. The Soviets also hope to make many contacts with foreign businessmen to exchange information on fishery developments and to promote their fishery exports. (Tass, Nov. 30, 1966.)



FOREIGN

CANADA

"CANADIAN FISHERMAN" SEES COLLECTIVE RESPONSIBILITY FOR HIGH BOAT LOSSES

An editorial in the January 1967 "Canadian Fisherman" asks: "Why does the Canadian fishing industry lose so many boats through fire, collision, grounding, and bad weather?" Its title "...the wrecks are all thy deeds" is from Byron's poem "about the ocean's harsh tyranny over man," but the editors place on the sea only part of the blame for the death of ships. Yes, the editorial says, Canadian fishermen face extremely rigorous weather and icing conditions and operate in high density traffic. But the forebears of today's fishermen lived with these dangers and were certainly less well equipped for them.

The responsibility, says the editorial is not with the sea but with people. "We fail, year after year, to do anything effective about correcting the root evils of our entire safety environment--the lack of certificates of competency, the lack of load-lines beyond which a fishing vessel may not load, the lack of adequate stability criteria for vessel designers, the lack of adequate fire-fighting equipment. . . . Perhaps we have developed a subconscious and compulsive mental resistance to putting into practice reforms which we know will help to avert tragedy but which may also affect our profit and loss position? Is there any other way to explain how, in 1967, we still lack in the fishing industry such accepted standards of safety as load-line regulations and certificates of competency for skippers?"

Certificates of Competency Are Needed

The editors are fully aware that the requirement of a certificate of competency would idle many fishing skippers. To prevent the abrupt ouster of these older skippers, a gradual phasing-out process, say 10 years, could be adopted. It would give older men a chance to make other plans.

The editorial states: "The introduction of certificates of competency would go along way towards eliminating the causes of most of our losses. First, they would create an

atmosphere of professionalism, an awareness of certain standards, a confidence backed by knowledge rather than guesswork. Second, what is given can be taken away again--the skipper with a certificate of competency will need it for his livelihood; he is unlikely to risk having his certificate suspended or cancelled for overloading, for trying to ride out a storm when he could take shelter, for running a sloppy ship which is a floating accident or fire hazard."

The editors see no excuse for the absence of load-line marks on the hulls of fishing boats. "When a seiner comes round the breakwater, belly deep in the water and decks awash, aren't we delighted? The more fish we bring in, the more money everybody makes--this is the way our 'lay' system works. Isn't it every skipper's fondest ambition to bring in the biggest load of fish. . . to be recognized as the 'highliner' of the fleet? Isn't this 'highliner' caste symbol, in practice, our measure of a skipper's competency?"

And the causes of fire? The editorial says "the vast majority of fires aboard fishing boats occur through slovenly 'shipkeeping.' Equally true, they fail to be extinguished because the fire-fighting equipment is inadequate, or in poor working condition, or inaccessible for one reason or another. We doubt if there is a fire-detection system aboard a single commercial fishing boat in Canada."

Note: The February 1967 issue of "Canadian Fisherman" reports Canadian Government plans to require certificates of competency for masters and mates of fishing vessels over 100 gross tons after January 1, 1968. Applicants will have to pass examinations to qualify for them. However, a special provision will allow current masters and mates to get certificates without examination if they apply before January 1968 and have worked on a vessel of at least 25 gross tons.

* * *

SETS LIMIT ON LOBSTER TRAPS

Requests from a large majority of Canadian lobster fishermen on the north shore of Prince Edward Island have led to a lobster trap limit of 500 per boat for 1967 in a portion of Canadian District 7B. This covers the area between East Point and North Cape on Prince Edward Island. It will be effective for the season from May 1 to June 30, 1967.

Canada (Contd.):

The high limit was set because of the short notice given. It probably is the first step toward a lower trap limit in the future. A limit was set in Canadian District 8 in 1966 as an experimental measure to protect lobster stocks and ensure better economic returns to fishermen.

To Survey Lobster Areas

Canada plans to survey this year lobster fishing areas throughout the Maritime Provinces--to see whether greater trap limitations and other controls may be necessary in 1968.

As another interim measure affecting the shore of Prince Edward Island, lobster fishing licenses for part of District 7B will be issued this year only to those who held such licenses in 1966, except for extenuating circumstances.

Also, it is planned this year to register all fishing boats in the Maritime Provinces. The Fisheries Minister feels that further measures may be necessary to protect this valuable industry from overfishing. (Canadian Department of Fisheries, Jan. 31, 1967.)

* * *

EAST COAST HERRING MEAL
INDUSTRY EXPANDS

Three new herring fish meal plants have been set up on Canada's East Coast during the last 18 months. A fourth is scheduled to be built in Stephenville, Newfoundland.

Plans for a fifth plant were announced Jan. 25, 1967, by the Canadian Fisheries Minister. The new plant will be on Campobello Island in New Brunswick. Scheduled for completion in June 1967, the plant will have a daily capacity of 350 tons of herring yielding 70 tons of fish meal and 35 tons of fish oil. Processing capacity could be expanded later. The plant is being built by Canadian Seafood Ltd., reportedly a partnership of a German and a local company.

In British Columbia, some herring seiner operators are reported planning to transfer their vessels to the East Coast when the West Coast fishery closes in March. (U. S. Embassy, Ottawa, Feb. 1, 1967, and other sources.)



SOME FISH "TASTE" WITH THEIR FINS

If man could taste with his fingertips and toes, he would have an ability which is not uncommon among certain fish. A study of two fish species which locate food with sense organs in modified fins was described in a joint paper by a scientist with the University of Michigan and his associate with the University of California.

Modified pelvic fins of the squirrel hake are transformed into tendrils which trail below and in advance of the fish, it was explained. The modified fins are studded with taste buds. Laboratory work indicated that those sensory organs are sensitive to food decomposition products in the water.

Another species, the searobins, exhibits modified pectoral fins which are essentially digging organs. Oscilloscope records from nerves of the fins showed them to be sensitive to mechanical, chemical and thermal stimuli.

Fish having the adapted fins appear to depend on them. When the fins were missing on either side, the fish had difficulty locating food in that direction.

Modified fins of fish may be useful in other ways. During mating periods, some fish appear to identify mates by their fins. (The University of Michigan News Service, Ann Arbor.)

LATIN AMERICA

Argentina

ADOPTS 200-MILE MARITIME JURISDICTION

On January 4, 1967, Argentina extended its maritime jurisdiction over adjacent waters 200 nautical miles from low tide. In the Gulfs of San Matias, San Jorge, and Nuevo, the distance will be calculated from base lines drawn from headland to headland. Also, sovereignty is extended to the adjacent "sea bed and subsoil of submarine zones" up to the 200-meter isobar--or beyond that depth where exploitation of natural resources is feasible. Freedom of air and sea navigation is not affected.

Within 90 days, the Argentine Government is scheduled to issue permanent regulations on foreign exploitation and exploration of the sea resources within the 200-mile zone. Until then, these temporary measures apply to foreign fishing and conservation: the Chief of Naval Operations (CNO) will issue permits (to expire March 29) to foreign flag vessels for fishing beyond the 12-mile zone; Naval Operations will verify that foreign vessels comply with requirements of the Convention of Safety of Human Life on the High Seas and charge an inspection fee of 10,000 pesos (US\$12.82); foreign vessels authorized to fish must communicate positions daily; and foreign vessels currently fishing have 15 days to comply with the temporary measures.

Brazil Disturbed by Action

Foreign vessels now fishing within the newly claimed Argentine waters are believed to be Brazilian, Uruguayan, Soviet, and perhaps Japanese.

Brazil believes the Argentine 200-mile jurisdiction will seriously impair Brazilian fishing for hake off the Argentine coast. A Brazilian Navy official also expressed deep concern and termed the action an acute threat to Brazilian interests. On the other hand, public reaction in Peru favored the Argentine declaration as helping the 200-mile claim "to be incorporated into Latin American international law." (U.S. Embassies in Buenos Aires, Jan. 4, 1967; Rio de Janeiro, Jan. 6, 1967; and Lima, Jan. 7, 1967.)

Foreign Vessels Need Authorization To Fish

Starting January 29, 1967, foreign vessels fishing in the Argentine 200-mile Maritime Zone will be required by Argentina to obtain authorization. (U. S. Embassy, Buenos Aires, Jan. 18, 1967.)

SOVIETS PROTEST ARGENTINA'S 200-MILE MARITIME JURISDICTION

On February 2, 1967, the Soviet Embassy in Buenos Aires issued a statement disputing Argentina's right to extend unilaterally its maritime jurisdiction to 200 miles. The Soviet statement accuses Argentina of violating the rights of other states to fish on the high seas guaranteed by the 1958 Geneva Convention on the High Seas. (Argentina, however, has not ratified the Convention.) The USSR rejects the notion that any nation has the right to extend its sovereignty beyond 12 miles, or otherwise interfere with freedom of the high seas.

The Soviet Embassy's statement added that the payment of fishing fees to Argentina was done only for "commercial reasons upon instructions of boat owners." The statement expressed Soviet expectation that Argentina will reconsider its position. (U. S. Embassy, Buenos Aires, Feb. 3, 1967.)

Comment: It is known that Soviet fisheries operations on the high seas are supervised by the Ministry of Fisheries and that Soviet vessels engaged in distant-water operations are not privately owned.

One Soviet Captain Reportedly Accepted Change

Earlier, it was reported that the captain of a Soviet factoryship deposited 400,000 pesos (US\$2,000) to cover inspection fees for 40 Soviet fishing vessels operating in Argentine-claimed waters.

The captain and the Argentine Navy agreed that Soviet vessels would concentrate 40 miles off the coast of Necochea and off Valdes Peninsula, Chubut Province, where the Argentine Navy will board, inspect, and deliver individual licenses.

Argentina (Contd.):

The Argentine Navy announced the beginning of enforcement patrols on January 29. Any unlicensed foreign fishing vessel found inside the 200-mile maritime jurisdiction will be given 8 hours to begin to leave the 200-mile area--or pay a 10,000 peso (US\$50) license fee. If the vessel refuses either, the Navy will escort it to the nearest Argentine port.

The Foreign Office told the press on January 27 that Brazil has formally raised questions regarding the new law and its application. Argentine officials met January 26 to study Brazil's proposal for negotiations and to consider implementation of the new fishing regulations. (U. S. Embassy, Buenos Aires, Jan. 27, 1967.)



Cuba

WILL NOT RECOGNIZE ARGENTINA'S 200-MILE WATERS

On Jan. 28, 1967, the Cuban Ministry of Foreign Affairs condemned the "arbitrary" and "irrational" decision of the "Argentine Military Government" to extend unilaterally its territorial waters to 200 miles. It called the act "a flagrant violation of the 1958 Geneva Convention" adopted by a majority of nations, among them Argentina.

Cuba pointed out to Argentina that if the U. S. extended its territorial waters to 200 miles--that would encompass all of Cuba, only 90 miles from the U. S. coast. The Cuban Government, therefore, will not recognize the Argentine extension--either "de facto" or "de jure." The statement called the "payment of any tribute" to Argentina for the right to fish within its claimed waters "immoral, clumsy, and cowardly."

Cuban tuna vessels have been reported fishing along the Brazilian and Argentine coasts in recent months, sometimes with Soviet vessels.



Mexico

EXTENDS FISHERIES JURISDICTION TO 12 MILES

The law extending Mexican fisheries jurisdiction from 9 to 12 miles was promulgated in "Diario Oficial" on January 20, 1967. The law permits foreign nationals now fishing in the 9- to 12-mile zone to continue without restriction for one year starting January 1, 1967. During 1967, Mexico will negotiate with these countries conditions permitting their nationals to continue fishing for a maximum additional 5-year period--through 1972. Starting in 1973, however, no foreign country will be permitted any fishing rights within the 12-mile limit, nor will the historic fishing rights of nationals of any country be recognized. (U. S. Embassy, Mexico, Oct. 21, 1966, and Jan. 23, 1967.)

* * *

FIRM MAKES SHIPBOARD FISH MEAL PLANTS

A Mexican firm reportedly has manufactured some shipboard fish meal plants to be installed aboard shrimp vessels for processing incidental catches of trash fish into fish meal. Several plants already have been distributed and installed aboard shrimp vessels operating out of Mazatlan, Mexico. The fish meal is produced at a relatively low cost because the same crew operates the fish meal plant. The quality is satisfactory. The fish meal competes successfully on the world market with other meal produced by shore plants. The shipboard plant is capable of producing 1.5 tons of fish meal daily. It is patented in several countries, including the U. S. Write to: Mr. Ing Hector Vargas, Productos Marinhos Industrializados, S. A., Mexico 6, D. F. Mexico.



Chile

FISH MEAL AND OIL PRODUCTION IS UP

Chile's anchovy catch for October 1966 (principally in Arica and Iquique areas) was 14,474 metric tons; it was 4,653 tons in October 1965 and 57,838 tons in October 1964.

Chile (Contd.):

From January-October 1966, the catch was 1,016,743 tons, compared to 310,059 tons in 1965 and 792,700 tons in 1964 for the same period.

Month	1966	1965	1964
. (Metric Tons)			
January	33,504	12,836	24,131
February	27,113	11,371	23,576
March	13,536	10,275	4,768
April	14,068	3,587	16,373
May	26,708	4,090	16,232
June	18,783	2,989	17,271
July	17,872	2,188	6,978
August	17,920	3,651	5,783
September	11,625	794	11,250
October	2,757	888	11,007
Total (10 months) . . .	183,886	52,672	137,369

Chilean production of fish oil from anchovy during October 1966 was 323 metric tons, compared to 61 tons in October 1965 and 904 tons in October 1964. Fish oil production for January-October was 17,829 tons in 1966, 6,035 tons in 1965, and 14,844 tons in 1964.

The price paid to the independent vessels for anchovy fluctuated between 50 and 55 escudos (US\$11.10 and 12.20) a metric ton.

Also, from Antofagasta to Talcahuano, the use of other species (principally sardine, hake, and anchovy) for fish meal yielded 2,872 tons in October 1966 compared to 1,361 tons in October 1965. Meal production for January-October 1966 was 24,786 tons; it was 17,692 tons in the 1965 period.

Exports of fish meal for January-July 1966 were 115,492 metric tons worth US\$16,182,356 f.o.b. Chile. Exports went mainly to the U.S., Netherlands, and West Germany. Exports of fish oil through July 1966 were 10,792 tons worth US\$1,825,652 f.o.b., destined for The Netherlands, West Germany, and France. (Institute of Fishery Promotion, Santiago, Nov. 23, 1966.)



Ecuador

FISHING INDUSTRY GROWS

Ecuador's fishing industry continues to grow. Exports of canned and frozen tuna, shrimp, and spiny lobster are increasing appreciably. The increase in tuna exports

occurred despite a bait shortage that prevented attainment of the full potential catch.

In July 1966, the Government authorized duty-free entry for equipment and materials required by local fishermen. In October, it reorganized the Fisheries Institute to increase its scientific and technical assistance to the industry. Also, Ecuador has agreed to the conservation measures on yellowfin tuna recommended by the Inter-American Tropical Tuna Commission.

The new Merchant Marine Academy founded at Guayaquil in mid-July 1966 includes fishing operations in its curriculum. The Government is considering enactment of a National Fishing Law.

These promising Government moves have encouraged private enterprise to enter the fishing and fish packing field on a large scale.

Subsidiaries of Foreign Firms Active

Among established firms, a subsidiary of a California tuna packer is expanding in Manta; a subsidiary of another California firm recently established a tuna-freezing operation in Manta. Among new firms, one in Guayaquil is canning "Pinchagua" sardines, and another is packing shrimp; at Salinas, a firm has been organized to produce industrial fishery products, and another announced plans to produce annually 2,240 tons of "fish flour" and 112 tons of oil. A Chilean fishing firm has studied plans for tuna packing at Santa Rosa using Chilean tinplate for cans; at Manta, another Chilean-owned firm readied its two 500-ton refrigerated tuna vessels for fishing. A fishery affiliate of a large construction firm organized a Galapagos-based freezing and canning operation. Also, at the northern port of Esmeraldas, a fishery firm made its initial 3-ton shipment of frozen shrimp to the United States, with similar semi-monthly shipments scheduled for the future. Another large firm planning to build a modern long-range fishing fleet continued negotiations with a financing group. (U. S. Embassy, Quito, Jan. 14, 1967.)

* * *

ISSUES TEMPORARY FISHING LICENSE

Ecuadorian authorities are issuing to U.S. vessels a temporary document valid in place of register and fishing license. The docu-

Ecuador (Contd.):

ment can be shown if a vessel is stopped by Ecuadorean patrol craft. Three U. S. vessels claim that register and license have been secured quickly, with good cooperation from the fishing inspector and port captain's office in Guayaquil. One U. S. vessel arrived early one Sunday morning and sailed with a validated temporary document at noon the same day. (U. S. Consulate General, Guayaquil, Jan. 30, 1967.)



Venezuela

WHOLE SARDINES MAY NOT BE USED FOR FISH MEAL

The Venezuelan Government has reaffirmed that whole sardines may not be used for fish meal--a conservationist position. While it is generally accepted that the sardine resources are presently underexploited, it is readily acknowledged that there is insufficient evidence to prove that uncontrolled fishing would not endanger them. The fishery employs 5,000 workers and is an important food for low-income groups.

The reaffirmation resolved a controversy between the sardine canneries of Cumana and the fish reduction plant of Puerto La Cruz--which a Government resolution had triggered.

The resolution was designed to enlist the aid of private fishing vessels in experimental fishing and providing data on fishing effort and catch necessary to better evaluate Venezuela's fishing potential, particularly the sardines. Private vessels can work in restricted areas if fishing data are kept and submitted to Government authorities. Canneries have priority on sardines caught by these vessels up to 80 percent of their installed capacity; however, 20 percent of their catch may be assigned as whole fish to reduction plants after they meet previous obligation to canneries.

Reduction Plant Owner Saw Green Light

The new owner of the reduction plant at Puerto La Cruz interpreted the latter provision as a change in the standing prohibition on using whole sardines for meal. The plant offered Bs100 (US\$22.32) per ton at

plant side compared to Bs40 (US\$8.93) per ton paid by the canneries. Priority rights of the canners and identity of catch were lost with the large margin in price; net fishermen and experimental vessels sold to the reduction plant's pick-up boats.

The dispute broke as the 1966 sardine season was closing. The canneries took advantage of the seasonal layoffs to obtain a high-level decision on the use of whole sardines by reduction plants. The standardized price structure between canneries and fishermen for the 1967 season was jeopardized. Moreover, most canneries have small reduction plants and probably would modernize those facilities during the off-season--if there was a good possibility of using whole sardines for meal. The canneries, citing the U. S. experience on the California coast, noted that limited sardine fishing is still maintained there. They recalled the noticeable depletion of sardine resources in 1955 when Venezuela permitted uncontrolled fishing. The high employment among low-income coastal families lent political weight to the canneries' claim to priority.

The Puerto La Cruz reduction plant owner contended that the sardine resources, with an annual potential placed at 400,000 tons by the La Salle Foundation, could support a reduction industry. He argued that the canneries, now consuming around 40,000 metric tons, must pay a better price to the fisherman to encourage greater effort and support modernization of fishing equipment. He noted that the recent French Mission found the price paid for sardines in Venezuela one of the world's lowest.

Council Formed To Study Industry

Venezuela's regulations continue to restrict the fish reduction industry to three species of whole fish, rabo amarillo (*Cetengranlis edentulus*), bagre (*Arius spixii*), and machuelo (*Opisthonema oglinum*), and canneries offal. The dispute, however, focused attention on the fisheries industry and its potential. President Leoni has named a National Council of Fisheries Development of three commissions: Fisheries Investigations, Fisheries Administration, and Industry Arbitration.

The U. N. Special Fund Project for Fisheries Research and Development, requested by Venezuela, is in the final stage of prepara-

Venezuela (Contd.):

ration. This joint 5-year project should begin in 1967, bringing to Venezuela internationally known fisheries experts. (U. S. Embassy, Caracas, Dec. 13, 1966.)



Brazil

SOVIETS SEEK BRAZILIAN MARKET

In January 1967, the Soviet stern trawler "Livadia" (Tropik-class RTM-7023, 2,600 gross tons) reached Porto Alegre in southern Brazil to deliver 400 metric tons of frozen fish at a low price of US\$145 a ton (about 7 U. S. cents a pound). (U. S. Embassy, Rio de Janeiro, Jan. 6, 1967.)

The Livadia was unable to sell her catch and departed on Jan. 6, 1967. No fish wholesaler in Porto Alegre would buy the "carapina" because it was not familiar to the public. The fishing industry reportedly was shocked by the low price of Soviet fish--60 percent below the going local prices. The Brazilian Bureau of Fisheries at Porto Alegre protested to Rio that the sale would be harmful to the local industry already troubled by "glutted markets."

The Livadia, of the Sevastopol High-Seas Fisheries Administration, arrived on the Patagonian Shelf fishing grounds in October 1966. The catch of 400 tons (880,000 lbs.) in less than 2 months was fair fishing.



Peru

REPORT ON FISH MEAL INDUSTRY

The Peruvian fish meal industry is in economic difficulty partly because of an industry-wide strike, November 1-December 14, 1966, and the continuing lower world price. Although this price strengthened during the strike, it is still much below recent years and even below the break-even point for many plants. There is little optimism that the price will rise much this season.

The prolonged strike reduced Peruvian fish meal stocks, which were substantial

shortly after the fishing season began September 1, 1966. However, the strike put many plants in serious difficulties because they could not meet payrolls or other expenses. Also, the increases won by the strikers place a greater burden on companies already in the red.

Further, the crews of almost 2,000 purse seiners and 150 plants, roughly 40,000 workers, were unproductive during the 3-month closed season that ended September 1, and during the strike. The strikers have gone back to work for 30 days, pending acceptance of their demands.

Peru Requires Export License

This key industry's troubles impelled the Government to require, effective January 1, 1967, fish-meal export licenses, and fish meal to be sold abroad on quota system and allocation of markets by the National Fisheries Association.

In 1966, Peru produced 1,470,478 metric tons of fish meal; in 1965, 1,282,011; in 1964, 1,552,214; in 1963, 1,159,233 tons. Almost all fish meal is exported. Peru uses only about 20,000 tons; this is expected to increase somewhat this year.

Semirefined fish-oil exports, virtually total production because Peru uses little, in June-October 1966 were 56,052 tons.

Prices: Due to, and during the strike, the price rose from about US\$120 a ton for meal f.o.b. Callao to \$130 a ton. On December 21, the price was down to about \$128 a ton for meal; on January 3, 1967, it was the same. Crude fish oil on December 6 was \$154 c.i.f. Europe, and semirefined about \$160 a ton--up about \$14 in 6 weeks. On December 21, semirefined oil was \$175 a ton, crude oil \$160.

Fish meal prices are not expected to rise above \$135 a ton f.o.b. Callao during the next few months--which will not bring many companies a profit.

1967 Closed Season: The closing date of the current fishing season has not been announced. It is expected that the Government will set a season limit between 7.5 million and 8 million metric tons of anchovy. Because the strike was long, the closed season (usually June, July, and August) may be reduced.

Peru (Contd.):

Plants: As of November 15, 1966, there were 150 idle fish meal plants. During 1966, only 2 plants produced over 40,000 tons of meal each; one produced over 30,000 tons; 15 plants over 20,000 tons each; and 103 plants each under 10,000 tons. The industry still has many small producers.

Twenty-three plants were closed for non-strike reasons: they had no fishing fleet, no money to operate, had been foreclosed, or were too deteriorated.

Locations: The 150 plants are in 23 localities along the coast. However, 83 of the plants are in 4 places (Chimbote, Callao, Supe, and Tambo de Mora) and produced 59 percent of the fish meal so far this calendar year.

Destination: Over 50 percent of Peru's fish meal exports goes to 3 countries: West Germany (20.9 percent), the U. S. (19.9 percent), and Holland (10.7 percent).

The Strike: The fishermen's union (Federacion de Pescadores del Peru) struck for the following increases: 35.00 Soles (US\$1.30) per ton of anchovy caught for the crew, plus 6.30 Soles (US\$0.24) per ton for fishermen's benefit fund (Caja de Beneficios del Pescador), plus 1.95 Soles (US\$0.07) for social assistance fund (Fondo de Asistencia y Prevision)--a total increase of 43.25 Soles (US\$1.61) per ton.

On November 25, 1966, the Government granted a 22.00 Soles (US\$0.82) per ton increase--both sides rejected it.

On December 13, 1966, the union lifted the strike for 30 days until the Government could study its demands further. The fishermen won an increase of 22 Soles (US\$0.82) per ton of catch, in food allowances for ship's crew, in wages of ship's engineer--a total of about 31.50 Soles (US\$1.18) a ton for fish caught or US\$7.00 a ton for fish meal produced.

The producers claim they cannot afford any increase. They are seeking Government assistance through tax reductions (there is a direct tax of US\$8.00 plus a indirect tax on exported meal). However, the Government needs all its revenue.

Government Regulations: The Government, on December 9, 1966, undertook to regulate production and marketing of fish meal. A decree designates Marketing Committee of National Fisheries Association to work with Ministry of Agriculture, Industrial Bank, and fisheries associations to adopt a system of agreements on marketing fish meal. This will include setting marketing price and quotas for buyers.

Current Fishing Season: The current fishing season is the finest on record, but the industry still is plagued by a relatively low market price of near US\$130 a metric ton for fish meal f.o.b. Callao (on January 13, 1967), and mounting stocks. Stocks on hand on Dec. 15, 1966, were 279,000 metric tons. By year-end, 59,000 tons were shipped, but roughly 180,000 tons were produced in that same period, bringing stocks near 400,000 tons.

In January 1967, about 80,000 tons are expected to be shipped. But production will exceed 300,000 tons, increasing inventory to about 600,000 tons.

The Institute del Mar will recommend cessation of fishing from February 15 to March 30, 1967, to permit growth of immature fish--and continuation of fishing into June, possibly later, with maximum allowable catch of 8 million metric tons of anchovy for the season. The Institute also may recommend a 5-day week for fishing fleets.

The prospect for companies in heavy debt is bleak. Reliable sources continue to forecast a major industry shakedown. An industry leader said 40 percent of production is foreign owned--and will increase if the Government does not aid the fish meal industry. (U. S. Embassy, Lima, Jan. 7 and 19, 1967.)



EUROPE

USSR

AVERAGE PACIFIC OCEAN PERCH CATCH IS SMALLER

During the last 3 years, the Soviet average daily catches of Pacific ocean perch per large stern factory trawler (BMRT) decreased 35 percent. In 1964, each BMRT caught an average of 41 metric tons (90,000 lbs.) per day; in 1965, this average catch decreased to 38.4 tons; and in the first 9 months of 1966 to 27 tons.

Soviet Far Eastern fishery officials attributed the lower average daily perch catches to the fact that fishermen have not adapted fishing gear and methods to new conditions--not to biological depletion of stocks.

They accused the Sakhalin and Primorskii Krai Fisheries Administrations of red tape. They claimed that midwater trawl and pair-trawl gear is available, but it is not issued to fishermen in perch, hake, herring, wall-eyed pollock, and other fisheries. They urged immediate introduction of midwater and pair trawling in Soviet Pacific fisheries, especially in the newly developing pelagic fisheries. Most Soviet Pacific ocean perch catches are landed from fisheries off the U.S.-Alaska coast.

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ANTARCTIC WHALING FLEET IS SMALLER

For the 1966/67 antarctic whaling season, only 3 of the usual 4 Soviet whaling factoryships were assigned to hunt and process whales: the "Iuri Dolgorukii" from Kaliningrad; the "Sovietskaia Ukrainina" from Odessa; and the "Sovietskaia Rossiia" from Vladivostok. The fourth factoryship, the "Slava," was reassigned this season to North Pacific whaling.

The three Soviet motherships began whaling early in December 1966. A large group of scientists is aboard to study the biology of whales and their concentrations. One result of prior whaling research (now concentrated at Odessa) was the determination of the whale's life span at 30-40 years.

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AMUR RIVER SALMON RAN LATE IN 1966

The 1966 migration of Pacific chum salmon into the Amur River occurred unusually late. In normal years no salmon reach the spawning grounds later than about mid-September. In 1966, however, chum salmon continued to migrate until the end of September. Soviet scientists believe the fish were delayed by storms in the Sea of Okhotsk and the Tartary Straits. Despite the late migration, all fishing for salmon ceased by mid-September to allow more chum to reach the spawning grounds to help build up the decimated stocks.

To protect spawning salmon migrating upstream, the Soviet Far Eastern lumber industry was asked to truck timber rather than float it down river during the salmon spawning season. Many fish hatcheries, and pools where young fish can grow undisturbed, have been built along the Amur River.

* * *

SAKHALIN LOOKS AHEAD 15 YEARS

The Scientific Council of the Sakhalin Institute for Fisheries and Oceanography met in December 1966 to discuss the present condition of fishery resources around Sakhalin and the development of its fisheries during the next 15 years. Two conclusions were reached: (1) Fishery resources around Sakhalin Island are not fully exploited. The catch can be increased several times. (The principal species caught are Alaska pollock, squid, Pacific cod, ling cod, anchovies, shrimp, and seaweed.) (2) Sakhalin catches in the eastern Pacific and Bering Sea also can be increased. Species mentioned were flounder, herring, ocean perch, sablefish, and hake. Sakhalin fishermen made good 1966 hake catches. Their yearly plan provided for only 6,000 metric tons. By December 2, when the fleet left the Pacific northwest fishing grounds, they had caught 24,000 metric tons.

The entire Soviet Pacific hake catch in 1966 was 130,000-140,000 metric tons, all caught off Washington and Oregon.

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JAPANESE TECHNICIANS OBSERVE SOVIET NORTH ATLANTIC OPERATIONS

In October 1966, 4 Japanese observers boarded the 2,500-ton Soviet stern trawler

USSR (Contd.):

"Pushkin" in the Northwest Atlantic area. They spent 40 days aboard Soviet vessel off Southern Labrador and observed fishing and processing of cod and ocean perch into fillets, canned cod liver, cod-liver oil, dressed cod and perch, and meal. Average daily production used only 20 metric tons of fish a day, which the Japanese say would be uneconomical for them. They also reported Soviet gear and equipment less sophisticated than their own. Soviet sources report that the Japanese made "a number of practical recommendations in handling trawls and in automating trawl winches."

The visit was part of the Fishery Science and Technology Exchange Agreement concluded between Japan and the USSR in mid-1966. ("Suisan Keizai Shimbun," Dec. 26, 1966, and other sources.)

* * *

TEAM OBSERVES
JAPANESE TUNA FISHING

A Soviet tuna fishery team arrived in Japan December 23, 1966, under the Japan-USSR fishery technical cooperation program and was scheduled to board Japanese tuna vessels to observe fishing operations in the South Pacific. The team consisted of one fishery expert from the Soviet Fisheries Ministry, a navigator assigned to a Soviet tuna factoryship, and an interpreter. The members boarded the Japanese tuna vessel "Kuroshio Maru No. 11" (180 gross tons) scheduled to depart Tokyo on December 28 for the South Pacific Ocean (near 178° W. longitude and 8° S. latitude).

On January 18, 1967, the Soviets transferred at sea to the "Banshu Maru No. 5" (3,677 gross tons) to observe fishing operations until February 26, 1967, then return home aboard a Soviet vessel. ("Suisan Keizai Shimbun," Dec. 26, 1966.)

Note: Later reports said Soviets returned to the USSR because accommodations aboard the vessels were unsatisfactory.

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CANADIANS AND OTHERS
STUDY TRAINING OF RECRUITS

In December 1966, eight Canadian Federal and Provincial officials were in the Soviet Union studying the methods used in training

recruits for the fishing fleet. Led by Lloyd J. Crabbe, Administrator of the Vocational Training Program, Industrial Development Service of the Canadian Department of Fisheries, the group visited the navigational and technical fishery schools at Murmansk and Rostov on the Don.

The tour resulted from a proposal of the Canadian Federal-Provincial Atlantic Fisheries Committee. Under a reciprocal arrangement, Soviet fishery officials will visit Canada in 1967 to study Canadian training methods.

The visit by Canadians follows one by the Norwegian Fisheries Minister with a group of experts; a visit by a Japanese team which spent a month aboard Soviet vessels; fishery research exchanges with Norway, Britain, and Iceland; and an October 1966 FAO seminar for trainees from 8 underdeveloped nations.



Denmark

GOVERNMENT BANK LOANS ROSE
IN FISCAL YEARS 1965-66

The Royal Danish Fisheries Bank, a Government bank that makes loans to the fishing industry, received 244 loan applications in fiscal 1966, April 1, 1965-March 31, 1966--75 more than the previous year. The Bank made 168 loans in fiscal 1966 totaling 30.5 million kroner, US\$4.4 million, compared with 20 million kroner, \$2.9 million, in fiscal 1965.

Losses on loans during fiscal 1966 amounted to 37,805 kroner (\$5,481); total funds on loan increased to 137.3 million kroner (\$19.9 million). Loan payments amounted to 10.5 million kroner (\$1.5 million). Interest paid totaled 7.5 million kroner (\$1.1 million).

During fiscal 1966 the Bank financed loans by issuing two series of bonds paying 7 percent interest and one series paying 6 percent. (When a loan is approved, the fisherman receives bonds for the amount of the loan and must sell them to receive his funds.)

In October and November 1965, many applications were received for loans on large vessels. If the Bank had allowed loans for all

Denmark (Contd.):

Purpose	Fiscal 1966			Fiscal 1965		
	No. of Loans	Value		No. of Loans	Value	
		Kr. 1,000	US\$1,000		Kr. 1,000	US\$1,000
Purchase of:						
New vessels	94	21,335	3,093	64	11,549	1,675
Used vessels	26	2,355	341	14	1,403	203
New motors	29	1,560	226	9	287	42
Power block	1	68	9	-	-	-
Echo sounder	-	-	-	2	6	1
Industrial use	17	5,182	751	24	6,672	967
Reorganization loans for fishermen in difficulties	-	-	-	1	58	8
Marketing	1	20	2	5	89	13
Total	168	30,520	4,422	119	20,064	2,909

applications, its legal limit would have been reached rapidly. Thereafter, loans would have been limited to the amount repaid by debtors during the year, or about 10 million kroner. Therefore, following discussions with the Danish Fisheries Minister, the Bank management decided to control the rate of lending by instituting a priority system: Applicants needing immediate assistance would be favored over those with usable vessels.

The Bank has proposed legislation to the Fisheries Minister raising the program's legal limit. (U. S. Embassy, Copenhagen, Jan. 11, 1967.)

* * *

SOLVENT PROCESS CAN PRODUCE HIGH-QUALITY FISH MEAL

A Danish newspaper reports that a solvent-extraction process to remove smell and taste from fish meal has been developed by the technological laboratory of the Danish Fisheries Ministry. Cost of the process is competitive with other processes for producing high-protein mixtures. The process reduces oil content of fish meal making it more desirable as pig feed. (U. S. Embassy, Copenhagen, Jan. 10, 1967.)

* * *

REQUIRES DATE MARKING OF PRESERVED FISH

Starting January 1, 1967, all canned fish products sold in Denmark must bear a mark showing week they were produced. Either open marking or a code can be used on sterile canned products; but any code used on semipreserved items (those having a limited shelf life) must be understandable to the consumer. Also, semipreserved fish items must

be stamped "halvkonserves." The requirements apply to all such products, domestic or foreign. (U. S. Embassy, Copenhagen, Jan. 10, 1967.)



Iceland

1966 FISHERIES CATCH SET RECORD

The 1966 Icelandic fish catch (preliminary data) was a record 1.24 million metric tons compared to 1,199 million tons in 1965. The 1966 catch was (comparable 1965 data in parentheses): herring 775,000 (763,000) tons, capelin 125,000 (50,000) tons, groundfish 335,000 (381,000) tons, and lobster and shrimp 5,000 (5,000) tons.

The 1966 catch showed a slight increase due to larger herring and capelin catches. However the total export value probably will be substantially lower than 1965 because of lower quantity and prices for the groundfish catch and the decline in world market prices for fish oil and meal. The groundfish catch declined about 46,000 tons, one important reason for the difficulties of freezing plants and trawler industry.

Reasons for Smaller Groundfish Catch

The continuing decline in groundfish catch in recent years is attributed to declining fish stocks, lack of modern trawler fleet, and a shift to herring fishing. The considerable increase in capelin catch resulted from a great effort by the fishing industry. It is considered a good development because capelin abound off Iceland's coast. Capelin are used primarily to produce fish meal and may compensate partially for any downturn in the

Iceland (Contd.):

herring catch. (U. S. Embassy, Reykjavik, Jan. 12, 1967.)

* * *

GROUND FISH INDUSTRY FACES PROBLEMS

Heavy operating losses have been reported by the large trawlers (700-1,000 gross tons) that supply about 20 percent of the Icelandic groundfish catch. High costs and exclusion from Iceland's 12-mile fishing zone are blamed by the trawler operators for their losses. The Icelandic long-line and seine-net vessels that can operate within the 12-mile limit supply about 80 percent of Iceland's groundfish catch. However, those smaller vessels are being used more in the expanding herring fishery.

The Icelandic Government is reported considering measures to stimulate the groundfish industry.



Norway

1966 LANDINGS AND EXPORTS HIT RECORD

Heavy catches of herring by her modernized purse-seine fleet raised Norway's 1966 fishery landings to a record 2.64 million metric tons. The exvessel value was 1,304 million kroner (US\$183 million). These were increases of about 27 percent in quantity and 18 percent in value over the previous record catch in 1965.

The value of Norwegian exports of fishery products reached a new record in 1966 of 1,575 million kroner (US\$221 million). This was an increase of about 150 million kroner (US\$21 million) above 1965's record exports. (The Export Council of Norway, January 1967.)

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SCIENTISTS PREDICT DECLINE IN COD STOCKS

Scientists say that there may be poor years ahead for Norwegian fisheries for small cod in 1969 and 1970--and for fisheries on larger, sexually mature cod in 1973 and 1974. Stud-

ies of cod reproduction conducted by the Norwegian Institute of Marine Research show that the 1965 and 1966 year-classes failed seriously. Practically no reproduction of those year-classes was found. The reason is not known; however, it is assumed that some catastrophe occurred during spawning. Future research will seek the specific cause. ("Fiskaren," Jan. 11, 1967.)



West Germany

TO EXPAND FISHING OFF SOUTH-WEST AFRICA

West Germany will send 12 factoryships and trawlers to join 15 foreign nations now fishing off the coast of South-West Africa. Several German fishing companies have formed a consortium to own and operate a large distant-water fishing fleet. The 12 vessels will be a start.

The vessels will be ultramodern trawlers similar to the "Sagitta Maris" and "Weser" already operating off that coast. They will be fitted with filleting and fish-meal plants and will first concentrate mainly on white fish (hake). Later, they may turn to pilchards and, like the "Willem Barendsz" and "Kosmos V," operate a fish-meal factoryship for pilchards off that coast.

The new West German fleet will be headed by the Government's modern fisheries research vessel "Walther Herwig," which will carry out intensive fisheries research in those waters.

The research vessel and part of the fleet are expected in those waters within the next month or two. ("Namib Times," Walvis Bay, Jan. 13, 1967.)



Ireland

AIMS TO DOUBLE FISHERIES EARNINGS BY 1970

One of the main goals of an expanded fisheries aid program recently outlined by the Irish Government is to double the earnings of its fisheries. At present, Ireland is limited

Ireland (Contd.):

mainly to inshore fishing yielding an annual catch of 30,000 to 40,000 metric tons. However, this modest catch provided export earnings of US\$5.5 million in 1965.

The Government will encourage construction of middle-distance vessels--two 107-foot stern trawlers were added in 1966--to expand the fleet. Government programs will be broadened in credit, training, product development, and export promotion. Compulsory standards will be introduced to regulate fish handling from the catching point through the entire distribution system. The Irish Minister for Agriculture and Fisheries said it was necessary to develop a "quality image" for Irish export products. ("Irish Skipper," January 1967, and other sources.)



Poland

TO EXPORT CANNED LAMPREYS

A Polish fishery cooperative has begun to produce canned lampreys for export via the state-owned foreign trade firm "Animex." Lampreys are landed mostly in the lower section of the Vistula River. So far, they have been used principally to make a marinated product. ("Polish Maritime News," Dec. 1966.)



Greece

FROZEN FISH LANDINGS INCREASED IN 1966

The Greek Atlantic freezer-trawler fleet landed 26,637 metric tons of frozen fish in the first 11 months of 1966, compared to 23,918 tons in the 1965 period.

The Government has proposed setting up a State-controlled company to distribute frozen fish in domestic and foreign markets. Most private Greek firms fishing in the Atlantic would participate in the new distributing firm with the option of eventually taking

it over. The object is to improve distribution and avoid the excessive buildup of frozen fish supplies that has occurred in the past. The Government also hopes to expand eventually trawling operations in offshore waters.

Shrimp fishing in both the Persian Gulf and the North African area yielded disappointing catches in late 1966. However, Persian Gulf fishing improved in December 1966. A Greek firm engaged in shrimp fishing there is reported to have acquired two more shrimp trawlers. ("Alieia," Dec. 1966.)



Italy

EEC APPROVES 30,000-TON DUTY-FREE TUNA IMPORT QUOTA

Japanese frozen tuna organizations say the European Economic Community (EEC) has agreed to revise Italy's frozen tuna import tariff system. EEC will authorize an increase in the duty-free frozen tuna import quota from the present 14,000 metric tons to 30,000. However, EEC reportedly proposed that even within the 30,000-ton quota, duty be levied on frozen tuna bought at prices below the standard US\$340 a metric ton c.i.f. established by EEC. In this case, duty would be paid on the difference between the two prices.

At present, Italy permits frozen tuna imports from non-EEC countries free of duty up to 14,000 metric tons; she assesses an ad valorem duty of 0.5 percent from 14,000-45,000 tons, and 15 percent over 45,000 tons.

It is reported that Japan, at the Kennedy Round in Geneva, plans to oppose EEC's establishment of the price standard. If unsuccessful, she intends to seek removal of skipjack from the proposed tariff. Japan also plans to seek a tariff reduction on her canned tuna in oil exports to EEC countries, presently assessed a 25-percent ad valorem duty. ("Nihon Suisan Shimbu," Jan. 30; "Suisan Tsushin," Jan. 27, 1967.)



ASIA

Japan

PURSE-SEINE TUNA FISHERY GAINS ATTENTION

Japanese distant-water purse-seine fishing is attracting wider attention as a way of improving tuna fishery management. It had been overshadowed by the growing high-seas trawl fishery. Some suggest that purse-seine operators should organize an overseas association to smooth operations.

At present distant-water purse seining is conducted experimentally in the eastern Atlantic off West Africa and in the South Pacific. The Atlantic operations began in late 1964 when Nichiro Fishing Company applied for a license to fish in the Gulf of Guinea with the 140-ton vessel "Kuroshio Maru" led by the 1,500-ton mothership "Chichibu Maru." The firm reportedly lost money during the first 2 years. But in summer 1966, when it added 2 more efficient two-boat seiners, "Hakuryu Maru" and "Seisho Maru," it managed to pull out of the red.

Taiyo Began Purse Seining in 1964

In the South Pacific, in spring 1964, Taiyo Fishing Company conducted the first purse-seine fishing with the power block-operated "Kenyo Maru" of 240 gross tons. Later, more seiners entered the fishery. Now it is reported that 6 vessels are engaged in the purse-seine fishery. Taiyo is building a 275-ton vessel to replace the Kenyo Maru. Another firm has ordered a large 350-ton seiner for the South Pacific.

The growing interest in this fishery is attributed to the average production per crew member on a purse seiner of around 60 metric tons per trip. This compares with 40 tons on a pole-and-line skipjack vessel and 18 tons on a long-liner. However, since the seine-caught fish are predominantly skipjack, there is a need to create greater market demand for them. Moreover, purse-seine operators face unstable fishing conditions--with catches some days running from zero to as high as 200 tons. So, unless fishing operation is coordinated with transportation by carriers, the owners will lose money. ("Suisan Keizai Shinbun," Jan. 16, 1967, and other sources.)

* * *

TUNA PURSE SEINING OFF NORTHWEST AFRICA IMPROVES

Purse-seine fishing for tuna by one Japanese company's 3 seiners off West Africa picked up in December 1966 after a slight slowdown in November. Catches were mostly large yellowfin, with landings of up to 300 tons per vessel in 2 days of fishing.

Most catches were exported to the U. S. because of weakening demand in Italy. Mid-December price of gilled and gutted yellowfin for delivery to West African ports was US\$440 a short ton, down \$10-15 a ton from November. ("Suisan Tsushin," Dec. 16, 1966.)

* * *

TUNA FLEET BASED IN AMERICAN SAMOA IS REDUCED

The Japanese tuna fleet based in American Samoa on January 1, 1967, totaled 25 vessels, a decline of 10 from early December 1966. In contrast, the Formosan fleet based there increased from 64 to 68 vessels, and the South Korean from 55 to 56 during the same period.

The sharply reduced fishing operations and higher operating costs of Japanese vessels, compared to the other two, are said to have considerably weakened Japan's position in negotiating tuna prices with U. S. packers in Samoa. ("Katsuo-maguro Tsushin," Jan. 18, 1967.)

* * *

SCIENTIST SUGGESTS ARTIFICIAL PROPAGATION OF TUNA

A Japanese tuna researcher suggests that tuna can be artificially propagated as a means of increasing production. Dr. Motoo Inoue, Fishery Research Laboratory, Tokai University, claims that tuna can be artificially bred, nurtured, and released. He urges Japan to take the initiative in launching a tuna hatchery project with international cooperation in the equatorial Pacific where atolls, reefs, and lagoons could be utilized as hatcheries and sea farms. (Private correspondence.)

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Japan (Contd.):

ADOPTS 80,000-TON FROZEN TUNA QUOTA TO U. S.-CANADA

The Japan Frozen Tuna Producers Association adopted at its January 25 meeting a direct export quota totaling 80,000 short tons of frozen tuna for the United States and Canada in business year 1967 (April 1967-March 1968). The 80,000-ton quota consists of albacore 35,000 tons, yellowfin 35,000 tons, and 10,000 tons reserved. Of the 35,000-ton quota, 32,600 tons are to be allotted to exporters on the basis of performance over the past three years, 12,250 tons are unassigned, and 150 tons are for newly authorized firms. The BY 1967 quota was 5,000 tons over 1966's quota based on a 10-percent increase in U. S. canned tuna consumption in 1966. ("Suisan Keizai Shimbun," Feb. 1, "Suisancho Nippo," Jan. 27, 1967.)

FROZEN TUNA EXPORT QUOTAS SET FOR BY 1967

The Japanese Frozen Foods Exporters Association agreed at the January 26 meeting ("Suisan Tsushin," Jan. 28, 1967) to set the following frozen tuna export quotas for business year 1967 (April 1967-March 1968):

Area I (U. S. -Canada)	- 110,000 short tons
Area II (Europe and Other Countries)	- 70,000 metric tons
Overseas Bases:	
American Samoa	- 25,000 short tons
Espiritu Santo	- 6,000 " "
Fiji Island	- 9,000 " "
Penang (Malaysia)	- 6,000 " "
Saint Martin (West Indies)	- 2,000 " "

FROZEN TUNA EXPORT PRICES WEAKEN

Despite declining tuna catches, prices of Japanese frozen tuna exports in late January 1967 continued to weaken, with U. S. packers showing no buying interest. One offer for US\$520 a short ton c.i.f. was received from a U. S. packer for frozen round albacore for direct export to the United States. But other than that, no new bids were received from U. S. buyers. In contrast, exvessel albacore prices in Japan have been rising gradually and were quoted in late January at 189 yen a kilogram (\$476 a short ton).

Prices of yellowfin (gilled and gutted) for direct export to the U. S. reportedly declined

to \$470 a short ton c.i.f., but even at that price U. S. packers were not showing much interest.

Atlantic-caught albacore prices were reported below \$440 a short ton f.o.b. Las Palmas, down more than \$60 a ton from the high of \$500 a ton reached in September 1966. ("Suisan Tsushin," Jan. 24, 1967.)

FROZEN TUNA EXPORT VALIDATIONS ROSE IN 1966

Frozen and fresh tuna validated for export in November 1966 totaled 19,867 metric tons—over 2½ times more than the 1965 exports of 7,687 metric tons. Exports for April-November 1966 were 127,565 metric tons, compared with 116,565 tons for the 1965 period. ("Suisan Tsushin," Dec. 28; "Suisancho Nippo," Dec. 23, 1966.)

Frozen and Fresh Tuna Export Validations, November 1966				
	U. S. -Canada	Overseas Bases	Other Countries	Total
Tuna:	... (Short Tons) 1/. . . (Metric Tons) . .			
Albacore 2/	6,988	4,024	299	10,289
Yellowfin 3/	3,643	808	2,386	6,425
Big-eyed 3/	67	367	789	1,183
Skipjack 2/	1,339	-	249	1,463
Bluefin 3/	-	-	3	3
Tuna loins	555	-	-	504
Total	12,592	5,199	3,726	19,867

Frozen and Fresh Tuna Exports, Apr.-Nov. 1966, with Comparisons				
	U. S. -Canada	Overseas Bases	Other Countries	Total
Tuna:	... (Short Tons) 1/. . . (Metric Tons) . .			
Albacore 2/	36,846	11,661	3,145	47,151
Yellowfin 3/	29,354	5,714	25,976	57,789
Big-eyed 3/	1,745	1,186	7,495	10,151
Skipjack 2/	6,428	9	1,727	7,567
Bluefin 3/	-	-	1,321	1,321
Tuna loins	3,953	-	-	3,586
Total	78,326	18,570	39,662	127,565
Apr.-Nov. 1965	80,743	7,898	36,100	16,565
1/To convert short ton to metric ton, multiply by 0.9072.				
2/Round fish.				
3/Gilled and gutted, dressed, and fillets.				

Japan (Contd.):

BOAT-CARRYING TUNA MOTHERSHIP
TO FISH IN INDIAN OCEAN

When the 2,800-gross-ton Japanese vessel "Kaigata Maru No. 58," serving as a carrier in the Antarctic whaling operation, returns to Japan in March, she will be converted to a six-boat-carrying tuna mothership. The owners are preparing to send the vessel to the Indian Ocean in April under a two-trip-a-year operational plan. Production goal is over 500 million yen (US\$1.4 million) worth of fish in the first year. ("Katsuo-maguro Tsushin," Jan. 9, 1967.)

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TUNA CATCHES ARE DECLINING IN
ATLANTIC AND INDIAN OCEANS

Japanese tuna catches in the Atlantic and Indian Oceans began to decline in mid-January. In the Atlantic, fishing fell off in all grounds except north of Saint Martin Island (West Indies, east of Virgin Islands) where albacore catches of around three tons a day were being landed. Off Brazil, where most Japanese long-liners were operating daily, catches averaged 2-2.5 tons of fish, mainly albacore.

In the Indian Ocean, where over 100 tuna vessels are fishing, landings averaged about 2 tons of fish a day. Vessels working the western grounds have nearly all switched from albacore to yellowfin. ("Suisan Tsushin," Jan. 24, 1967.)

* * *

ADOPT 1967 EXPORT QUOTAS FOR
SWORDFISH AND TUNA LOINS

The Japan Frozen Foods Exporters Association adopted an 8,000-ton quota for tuna loin exports to the U. S. in business year (BY) 1967 (April 1967-March 1968). This year's quota was reduced 1,000 tons from last year's because actual exports for BY 1966 were expected to fall considerably below the established quota.

The Association's swordfish committee decided on a 5,500-ton swordfish quota for BY 1967 exports to the U. S. ("Suisancho Nippo," Jan. 23, 1967.)

* * *

VESSEL OWNERS TO HIRE OKINAWANS

To alleviate a serious labor shortage confronting fishing vessel owners, the Yaizu Fishery Cooperative Association was scheduled to dispatch on January 19 three Association members to Okinawa on an 8-day recruiting trip. The team was to visit local high schools and junior high schools to interview graduating students interested in working aboard fishing vessels. The Association hoped to recruit about 80 students. ("Minato Shimbun," Jan. 17, 1967.)

* * *

ANTARCTIC WHALE CATCH
NEARS THIRD OF QUOTA

Japan's 3 whaling firms (4 fleets in the Antarctic) reported as of January 5 a catch of 448 blue-whale units since the Antarctic whaling season opened December 12, 1966. The catch of sperm whales was 297, producing 1,514 tons of sperm oil. Japan's quota of blue-whale units this season is 1,633. It was 2,340 units last season. ("Yomiuri," Jan. 9, 1967.)

* * *

ATLANTIC TRAWL FISHERY IS GOOD

There were about 70 Japanese distant-water trawlers in the Atlantic Ocean in early January 1967--about 60 of them concentrated off northwest Africa fishing primarily for octopus. The octopus fishing season, which begins around November, was at its height; good fishing was reported. Catches by 1,500-ton trawlers were 10-15 metric tons a day. After the octopus season ends in March, the vessels will switch to squid.

Trawlers off Africa's southern coast, where catches consist mostly of "merluza" (hake) and sea bream, were having good fishing. Daily landings were over 20 tons of merluza and 10-12 tons of sea bream.

The Atlantic trawl catch in 1967 is expected to reach 200,000 metric tons. Production in 1966 was 180,000 tons (estimate); in 1965, 160,000 tons; in 1964, 122,000 tons. ("Minato Shimbun," Jan. 5 & 6, 1967.)

* * *

Japan (Contd.):

OWNERS OF SEIZED VESSELS
WANT TOKYO TO REPAY FINES

Japanese fishery circles, disturbed by mounting seizures of vessels in recent years by countries claiming new territorial sea limits or exclusive fishing zones, are asking the Government to provide relief to vessel owners fined by such countries. These spokesmen say that because Tokyo adheres to the 3-mile principle and does not recognize exclusive fishing zones established unilaterally, it should compensate owners for fines imposed on their vessels stopped outside the 3-mile limit.

The Fishing Vessel Insurance Law of Japan compensates for vessel damages in war, rebellion, confiscation, seizure, detention, surface and underwater explosions; but it does not allow reimbursement of fines. Some industry members say the Government should enact a law similar to the U. S. Fishermen's Protective Act. ("Minato Shimbun," Jan. 17, 1967.)

* * *

MACKEREL FISHERMEN FIGHT
OVER TYPE OF GEAR

The mackerel fishing dispute between the pole-and-line fishermen and surrounding-net operators on the Pacific coast of Choshi, east of Tokyo, continued unresolved through December despite mediation efforts of the Fisheries Agency. It had begun early in the month. The flare-up occurred when the two factions accused each other of violating the fishing adjustment agreement concluded in spring 1966. At one time, the dispute threatened to erupt into violence, with 250 pole-and-line mackerel boats protesting in Tokyo Bay and fishermen holding rallies. The pole-and-line vessel owners contend that net fishing is ravaging the resource, causing extreme hardship for their fishermen, and are demanding that the Government act to prohibit nets in the local mackerel fishery. ("Suisan Keizai Shimbun," Dec. 23, 1966, and other sources.)

* * *

FIRM WILL BUILD TWO
4,000-TON STERN TRAWLERS

Two 4,000-gross-ton stern trawlers, reported the largest of their kind in Japan, are

scheduled to be built starting in mid-February at a Japanese shipyard for Nihon Suisan Fishing Company at a total cost of US\$5 million. Completion is set for late December 1967 for the first vessel, and late February 1968 for the second. That firm also plans to build a 500-ton trawler this year at an estimated cost of \$722,222. Construction was scheduled to begin in early February and completion set for late July. ("Minato Shimbun," Jan. 1967.)

* * *

FISHERMEN SEEK TO LONG LINE
IN GULF OF ALASKA

The Japanese Northern Water Longline and Gillnet Fishery Council has proposed that the Government extend the northern water operational area from the Bering Sea region (north of 50° N. latitude between 170° E.-175° W. longitudes) to the Gulf of Alaska. The proposal was adopted at a January 13, 1967, meeting to develop plans for 1967.

On January 14, the proposal was presented to the Agriculture and Forestry Ministry. The Council has 16 firms operating 19 catcher vessels in the Bering Sea bottomfish fishery.

The Council maintains that its vessels, which primarily fish for sablefish, operate gear at depths beyond 400 meters (200 fathoms) and, therefore, there is virtually no possibility that halibut would be taken from the Gulf as feared by the U. S. and Canada. ("Suisancho Nippo," Jan. 16; "Shin Suisan Shimbun Sokuho," Jan. 14, 1967.)

* * *

PRODUCES FISH BLOCKS FOR U. S.

Within the past year, Japan has begun to produce frozen blocks of fillets processed from South Atlantic hake or whiting for export to the U. S. This new product could have future significance in the Japanese export trade or domestic markets.

In 1959, Japan began to trawl commercially off the west coast of Africa. This fishery grew rapidly: production in 1964 was 122,000 metric tons, 160,000 tons in 1965, and 180,000 tons in 1966. Initially, domestic demand for squid, octopus, and sea bream from African waters almost supported the operation of the vessels.

Japan (Contd.):

The method of processing hake into frozen blocks of fillets is that used by other countries. In the north Atlantic, in 1963, Taiyo Fishery Company conducted a trial processing of filleted cod, haddock, and ocean perch into frozen fish blocks. At present, Taiyo is the only Japanese company producing fish blocks aboard factoryships at sea.

Note: This new leaflet contains a diagram illustrating the method of processing hake into fish blocks at sea. It is FFL-110--"PRODUCTION OF FISH BLOCKS IN JAPAN"--available free from the Branch of Foreign Fisheries, BCF, Room 8015, U.S. Department of the Interior, Washington, D. C. 20240.

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FISH MEAL PRODUCTION BY NEW PLANT IS 1,000 TONS

In 1966, the largest fish meal plant in Kyushu, Japan, processed fish meal and fish solubles totaling 1,491 metric tons valued at 54.8 million yen (US\$152,000). The plant was built by the Makurazaki Fish Products Processors Cooperative Association in December 1965 at Makurazaki, Kagoshima Prefecture.

Fish meal comprised 963 tons worth \$112,305, fish solubles 392 tons worth \$24,916, and fish oil 136 tons worth \$14,945. The plant processes scraps from "katsubushi" (dried skipjack loin) establishments in Kyushu. ("Minato Shimbun," Jan. 6, 1967.)

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1966 LANDINGS AT YAIZU REACHED ALL-TIME HIGH IN VALUE

Fish landings in 1966 at the major Japanese fishing port of Yaizu totaled 169,032 metric tons valued at 22,613,460,000 yen (US\$62.8 million). This was a substantial increase over 1965 receipts that totaled 149,168 tons worth 17,724,414,000 yen (\$49.2 million). The value of landings was the highest for Yaizu and also topped other ports.

While albacore receipts at Yaizu declined by 9,279 tons compared with 1965, the record value of landings was attributed to the increase in landings of other species--skipjack tuna (up 25,276 tons over 1965), mackerel (up 3,566 tons), and bluefin tuna, including yellowfin and big-eyed (up 122 tons). Another factor was the better quality fish brought back because of improved freezing systems

on vessels and the resultant higher prices. ("Minato Shimbun," Jan. 6, 1967.)

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BAIT SAURY PRICES UP

Prices of bait saury for the tuna long-line fishery rose sharply in early December 1966 and were expected to reach a high of 170-180 yen per kilogram (US\$428-454 a short ton) exvessel. Tuna vessel owners were concerned over the rising cost of this extensively used bait but hoped to obtain sufficient supply for 1967.

Japanese saury production in 1966, on December 15, was 235,000 metric tons, a slight increase over 1965 landings of 227,000 tons. Because the fish harvested were larger, much production was sold to the fresh fish market at around 150 yen per kilogram (\$378 a short ton) exvessel. ("Shin Suisan Shimbun Sokuho," Dec. 17, 1966, and other sources.)

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HERRING ROE PRICES SKYROCKET

The tremendous year-end demand in Japan for herring roe, a traditional New Year's delicacy, drove prices up to fantastic levels. In Tokyo's retail market, dried herring roe sold for 1,500-2,000 yen per 100 grams (US\$18.94-25.25 a pound) and herring roe in brine 400-550 yen per 100 grams (\$5.05-6.94 a pound). Although 1966 prices dropped 30-40 percent below 1965 prices due to good domestic herring production and increased imports, the product is still beyond the reach of the average consumer.

Herring roe imports into Japan, Government controlled, are handled by about 200 trading firms, and their number is increasing. Because some firms may even form dummy companies to establish import rights, the Government intends to limit drastically the issuance of import licenses in 1967 to about 30 firms in 1967, based on past performance. ("Suisancho Nippo," Dec. 22; "Nihon Suisan Shimbun," Dec. 21, 1966.)

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TO BUY MORE SHRIMP FROM PAKISTAN

A team from Marubeni-Iida, Nissho Trading Co., Osaka Branch Japan Export-Import

Japan (Contd.):

Bank, and the Ministry of International Trade and Industry (MITI) will go to Pakistan to study ways of promoting the purchase of primary products in order to overcome the latter's present trade imbalance with Japan. Since shrimp is a major fishery product and a large resource, it will receive considerable attention.

In 1965, Japan purchased 206 metric tons of shrimp from Pakistan worth about US\$354,000. In first-half 1966, purchases amounted to about \$223,000. With the growing domestic demand, increased imports of quality shrimp will find a good market. (Fishery Attaché, U. S. Embassy, Tokyo, Jan. 25, 1967.)

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SENDS SURVEY TEAM TO
PERU AND MEXICO

The Japan Fisheries Resource Conservation Association sent two members to Peru and Mexico on January 21 for a one-month fishery survey. In Peru, they will study fishery conservation programs, and the anchovy fishing and fish meal industry to improve Japan's fish food supply for cultured fish. In Mexico, they will study the shrimp fishing and processing industry, government policy, and research programs to gain knowledge on ways to promote Japan's shrimp fishery development. ("Suisan Keizai Shimbun," Jan. 11, 1967.)

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HELPS DEVELOP FISHERIES
IN PERU AND ECUADOR

The Japanese Ministry of Construction has established an International Construction Technological Association to help develop fisheries in Peru and Ecuador. A 5-member team left January 6, 1967, to study construction of a fishery terminal in Peru and the export of canned fish from Ecuador.

Although Peru is the world's No. 1 fishing nation, the Association noted that present production is almost entirely fish meal. Peru now plans to develop actively tuna and other resources for food. Three new fishery terminals will be built: Paita (or Boyován), Callao, and Mollend--each with cold-storage

and processing facilities to provide fish for distribution to interior towns and villages. In May 1966, the fisheries firm Promotora de Pesca was established to manage the terminals.

Ecuador To Develop Canned Tuna

In Ecuador, plans call for developing canned tuna for export; they will develop the fisheries and prevent seasonal unemployment. The Atlantic Community Development for Latin America will help build the canneries and develop export markets.

The Japanese study is subsidized by the Japanese Ministry of International Trade and Industry (MITI) and will take 47 days. The Association believes that Latin American fisheries will grow. It wants to give technical assistance--but also to find markets for Japanese machinery and material. (Fishery Attaché, U. S. Embassy, Tokyo, Jan. 12, 1967.)

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SECOND FIRM EXPLORES FOR
SHRIMP OFF NORTHERN AUSTRALIA

The Nihon Suisan firm plans shrimp explorations north of Australia in March. It will use its stern trawler "Asama Maru" (1,000 gross tons) now harvesting mainly sea bream off northeast Australia. If the operation proves successful, Nihon Suisan plans to enter into a joint shrimp venture with an Australian firm.

In early summer 1966, another Japanese fishery firm, Kyokuyo Hoge, licensed by the Fisheries Agency to conduct experimental shrimp fishing in the Gulf of Carpentaria, northern Australia, showed good results. ("Minato Shimbun," Jan. 28, 1967.)

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JAPAN-U. S. FISHERY VENTURE
PLANNED IN ALASKA

The Japanese fishery firm Hoko Suisan and trading firm Marubeni Iida are reported seeking the Japanese Fisheries Agency's approval to enter into a joint venture with the American TAD Fishing Company of Seward, Alaska. The joint company is scheduled to be formed in April 1967 with capital of US\$500,000--the Japanese firms contributing 49 percent and the U. S. partner 51 percent. The proposed enterprise will engage primarily in exporting locally caught shrimp and

Japan (Contd.):

king crab to Japan, with plans to add halibut and salmon to the export list. One-third of the products will be marketed locally. ("Suisancho Nippo," Jan. 27, 1967.)



Taiwan

PLANS TO EXPAND TUNA FISHERY

The Formosan (Taiwanese) tuna fishing industry, which has grown rapidly in recent years, may establish overseas bases this year to serve its expanding distant-water tuna fleet. The fleet now numbers over 100 vessels. The Formosan tuna fishermen have been using Japanese bases but are reported dissatisfied and eager to have their own.

Indications are that Formosa will establish 1 or 2 fishing bases in the Indian Ocean in 1967 with capital coming mostly from Chinese merchants in southeast Asia. Japanese financial and technical assistance also may be sought.

Central Buying Agency May Be Set Up

The tuna industry also is reported planning, with government support, to establish a centralized gear and bait purchasing agency. Japanese trading firms providing supplies to Formosan vessel owners under cooperative arrangements would lose good trading items. They may even find themselves in a bad bargaining position.

Formosa, like South Korea, exports most of her tuna catches to the U. S. Japanese observers view the growing emphasis on Formosa's tuna fishery as strengthening the latter's position in the international tuna market. They also fear that this trend will have a tremendous impact on Japan and may, in 2 years, dislocate the Japanese tuna industry. ("Minato Shimbun," Jan. 20, 1967.)



Republic of Korea

SELECTS PRIORITIES FOR NEXT 5 YEARS

The government of South Korea has selected 20 priority projects it hopes to carry out during the next 5 years with a US\$300 million development loan from AID. The loan includes \$16 million for fishery development. The loan will be added to West European loans and Japanese reparations to modernize Korea's coastal fisheries and expand her high-seas fishing.

In 1966, Japanese reparations used for fisheries amounted to \$9.5 million: \$5.6 million for processing facilities and ports, \$3.7 million for vessel construction and purchase of gear, and \$0.2 million for machinery and parts.

To promote exports of fishery products, South Korean Export Promotion Committee recommended extension of export credits from 3 to 6 months--and importation of tin cans until domestic output is assured at reasonable prices. ("Korean Business Review," vol. 1, no. 8, Dec. 1966.)



Philippines

TO EXPAND FISHPOND INDUSTRY

To increase the production of fish, the No. 2 food staple, President Marcos of the Philippines has moved to open 700,000 hectares of public domain to fishpond development.

On January 17, 1967, the President appointed a permanent committee to study and expedite the opening of these lands to private developers. Committee members are: the Secretary of Agriculture and Natural Resources, Chairman; the Chairman of the Development Bank, Vice Chairman; Undersecretary of Agriculture for Natural Resources, and the directors of the Bureaus of Fisheries, Forestry and Lands. (U. S. Embassy, Manila, Jan. 22, 1967.)



Australia

TASMANIA LIMITS SPINY LOBSTER FISHING LICENSES

Pending the results of an economic survey now underway of the State's spiny lobster fishing industry, the Tasmanian Government has limited commercial spiny lobster pot licenses to a maximum of 420. The Minister for Fisheries reported 388 boats licensed to take spiny lobster and others recommended for licensing. With more boats in the industry and others trying to enter, a survey of trends became necessary.

Statistics have shown a decline in the number and weight (lbs.) of spiny lobster per pot lift.

At present, the number of pots a licensed boat can carry is limited and there are sound reasons for limiting the number of boats entering the fishery.

Fishermen Accept Plan for Higher Fees

The Professional Fishermen's Association (PFA) had accepted proposals for higher licensing fees in 1967 and it was proposed to channel this money into research on the State's fisheries. In 1965, PGA urged the Government to freeze the number of licenses for spiny lobster pots.

Present controls do not apply to other forms of fishing and there is no restriction on the number of boats taking shark, finfish and pelagic fish, scallops, and abalone. However, certain areas were closed to shark and scallop fishing.

Future licenses would be restricted to a master fisherman operating one boat licensed in his name. The qualifications for the master license have been strengthened. However, a ceiling would remain on the maximum number of licenses issued.

The Minister anticipated completion of the economic survey in the first half of 1967. The Government's position on future licenses would be determined then. He said it was the Fisheries Department's responsibility to insure the full exploitation of the resource at a maximum sustainable catch. It was equally

important for the industry to function on a sound economic basis. ("Australian Fisheries Newsletter," Dec. 1966.)



New Zealand

FISH MEAL PLANTS PLANNED

Plans for a US\$1,430,000 fish meal plant that could be operating in the Bay of Islands, in the North Island of New Zealand, before the end of 1968 have been put before the Government.

The plant could process 2,000 tons of fish a day for meal and oil, but initial plans are for half this quantity. This proposal by a private firm is for 3 other plants to be established progressively over a period of 6 years at 3 other places--tentatively suggested at Gisborne, Nelson, and the west coast of the South Island.

Each factory would be highly mechanized and be built where they would be no threat to health or scenic beauty. ("Fishing News International," Jan. 1967.)



New Guinea

JAPANESE-AUSTRALIAN FIRM TO FISH SHRIMP

The Japanese Kinkai Hogeï Fishing Company, in a joint venture with an Australian trading company, was planning to dispatch a remodeled 350-gross-ton freezer vessel to New Guinea in late February to explore the coastal waters for shrimp, spiny lobster, and sea bass. The Japanese firm plans to ship the catches home, but it was also considering exporting to the U. S. shrimp and lobster--if they are available. Fishing season for sea bass, reported abundant, peaks around May-June. ("Suisan Tsushin," Jan. 13, 1967.)



AFRICA

South Africa

PELAGIC FISH CATCH DROPPED IN 1966

The total pelagic fish catch in South African waters for the 1966 season dropped from the 529,035 tons in 1965 to 394,517 tons. During 1966, there was an even greater reliance on anchovy--43.9 percent of the total catch. This compared with 36.8 percent in 1965, and 21.6 percent in 1964, when anchovy were first caught as a substitute for the declining Cape pilchard catches.

The situation is further aggravated by the fact that anchovy, although an acceptable substitute, yields considerably less oil than pilchard. The 1966 fish oil yield was estimated to average 7 gallons per ton, as against 11 gallons in 1965. Fish body oil sales, moreover, recently have been yielding 25 percent less than in 1966; this is attributable mainly to heavy production in Iceland.

Meanwhile, prices for fish meal have declined steeply as a result of Peru's active participation in pelagic fishing after her 3-month closed season during 1966. Also, South and South West Africa's position in the American spiny lobster market is facing competition from Brazil, Thailand, and Japan. This has not yet had much effect, however, on the income derived from exports of the local product. ("Barclay's Trade Review," Johannesburg, Dec. 1966.)



Ivory Coast

FISH CATCH DROPPED IN 1966

Abidjan's 70-vessel commercial fishing fleet landed 33,945 metric tons of fish and shellfish in the first 10 months of 1966--down 4.3 percent from the 1965 period. This decrease resulted largely from the poor sardinella catches in the first 4 months.

Administrative delays held up the call for bids to construct the second quay at Abidjan's fishing port. It now is expected to be advertised early in 1968. Latest reports indicate that the new 3,000-ton fish freezing plant may be started in April 1967 and completed in

March 1968. Its design and specifications have been under review by an American consulting engineer. (Fisheries Attaché, U. S. Embassy, Abidjan, Jan. 25, 1967.)



Mauritania

SEIZES JAPANESE TRAWLER

The 999-gross-ton Japanese trawler "Daishun Maru," operating off northwest Africa near Cape Blanco, Mauritania, was seized by the Mauritanian Coast Guard January 3, 1967, for fishing inside the 12-mile exclusive fishing zone. The Japanese Foreign Ministry protested and was seeking immediate release of the vessel.

This is the second Japanese vessel seized by Mauritania. In January 1966, the stern trawler "Taiyo Maru No. 71" (1,500 gross tons) was captured and fined the equivalent of 6 million yen (US\$16,666), which was later reduced to 1.5 million yen (\$4,166). ("Minato Shimbun," Jan. 8, 1967.)



Nigeria

CLAIMS 12-MILE TERRITORIAL WATERS

A decree would soon extend Nigeria's territorial waters from 3 to 12 miles "for all purposes," the Federal Military Government (FMG) said on January 3, 1967.

Two reasons were given: (1) the Ministry of Agriculture and Natural Resources is concerned about fishing trawlers operating off Nigeria's coast beyond the present 3-mile limit. In August 1966, the captain of Nigeria's research vessel "found about 17 Soviet trawlers fishing from 6 to 12 miles off our coast within a distance of 20 miles of either of the Bonny Rivers." These vessels, the FMG statement added, were not registered in Nigeria. The Government believes "that each regional government is at liberty to legislate in respect of fishing and fisheries within the territorial waters adjacent to its coast." If that is done, it will "be possible to ensure

Nigeria (Contd.):

that only Nigerian registered fishing vessels" will be permitted to fish the waters adjacent to Nigeria.

(2) Extending Nigeria's territorial waters would permit intensification of antismuggling operations. Now smugglers enjoy some immunity because of the 3-mile limit. (U. S. Embassy, Lagos, Jan. 5, 1967.)



Senegal

SOVIETS SUPPLY TUNA VESSELS

Representatives of the Soviet firm "Promachexport" contracted with the Government of Senegal to furnish the Société Sénégalaise de Pêche 10 refrigerated tuna fishing vessels worth 882,000,000 CFA francs (US\$3.6 million).

This is the first Soviet step to implement its loan agreement of March 22, 1965, of 1,650,000,000 CFA francs (\$6.73 million) to develop the Senegalese fishing industry.

The press reported that the vessels, over 100 feet long, will be constructed in Kiev and powered by French motors. They are scheduled for delivery to Dakar in 1968, 1969, and 1970. (U. S. Embassy, Dakar, Jan. 27, 1967.)



Foreign Fishing Off U. S. Coasts, January 1967

OFF ALASKA

Soviet: During January, Soviet fishing and support vessels increased from slightly over 100 to about 130.

Early in the month about 30 fishing and support vessels fished and processed Pacific ocean perch in the eastern part of the Gulf of Alaska off Yakutat. By mid-month, that fleet increased to over 45 vessels, concentrating off southeastern Alaska; by month's end, it was down to the initial 30, and switched to the Fairweather fishing grounds.

Ocean perch fishing in the central Gulf was limited: 3 trawlers operated on Albatross Bank during mid-month, and only 1 remained at month's end. One trawler fished near Chirikof Island in late January. The perch fleet between Shumagin Islands and Unimak Pass in the western Gulf increased from 7 to 14 trawlers and 3 support vessels during the first 2 weeks, then decreased to 6 trawlers and 1 support vessel by month's end. The decrease in vessels fishing for perch in the Gulf of Alaska during January probably resulted from a shift to the flounder fishery in the eastern Bering Sea.

Shrimp fishing on the Continental Shelf surrounding the Shumagin Islands continued at high level throughout the month. The trawlers increased from 18 to 21, and their catches continued to be processed by a canning factoryship.

The winter herring fishery north of the Pribilof Islands apparently has failed to develop for the second consecutive year. Only 5 trawlers and 3 support vessels are known to have been active during January.

The eastern Bering Sea flounder fishery continued to expand in January with a fleet of about 50 trawlers and 20 support vessels active by month's end. Most vessels fished just north of Unimak Island, but in late January a small part of the fleet moved north toward Cape Newenham.

Japanese: The number of vessels fishing off Alaska remained at 18 throughout January.

In early January, Japanese ocean perch operations off Alaska were conducted by one factory trawler, the "Kirishima Maru" off Southeastern Alaska, and by the factory trawlers "Zuiyo Maru No. 2" and "Ryuyo Maru" and one reefer south of Fox Islands in the eastern Aleutians. By mid-month, operations in both areas had ended. The perch fishery on Albatross Bank resumed about mid-month and, by month's end, the factory trawlers "Yutaka Maru," "Ryuyo Maru," and "Daishin Maru No. 12" were active.

In early January, the Japanese Alaska pollock fishery north of Fox Islands was conducted by the factoryship "Chichibu Maru" accompanied by about 8 trawlers and by the factory trawlers "Aso Maru" and "Tenyo Maru No. 3" (and her accompanying trawler).

About mid-month, those vessels were joined by the factoryship "Soyo Maru" and the factory trawler Zuiyo Maru No. 2. It is possible that the factoryship arriving about mid-month was accompanied by a fleet of trawlers, or she may have served as a support vessel for trawlers already active.

Two Japanese long-line vessels fished for sablefish off the coast of Southeastern Alaska during the first week of January. The number decreased to one (the "Tenyo Maru No. 18") the second week. It is believed operations ended in mid- or late January.

OFF PACIFIC NORTHWEST (Washington and Oregon)

Soviet: During January, Soviet vessels were limited to exploratory fishing. Only 3 stern factory trawlers and 5 side trawlers were sighted. The only concentration of vessels was seen on January 31: 4 side trawlers off Oregon coast. Three were traveling northward; the fourth appeared to be fishing. In prior weeks, only one Soviet vessel was sighted during weekly surveillance patrols.

A medium freezer side trawler (SRTM-432) left Vladivostok late in November 1966 and arrived off the U. S. Pacific Northwest coast on December 17, 1966. On December 20, she was sighted by a BCF foreign fishing surveillance patrol 25 miles west of Umpqua Light (near Newport, Oreg.). The vessel was seeking Pacific saury concentrations off U.S. coast for exploitation by the Soviet fishing fleet. Newport is in the general area where the Soviet scientists found the densest concentrations of saury during their 1965 research cruise. Irregular and smaller saury concentrations were found between 41° and 48° N. latitude.

The "Akademik Berg," flagship of the Soviet Pacific fishery research fleet returned from her Bering Sea cruise to Vladivostok in early January 1967. The aim of the 3-month cruise was to study deep-water (up to 1,000 meters) trawling for Pacific halibut and sablefish.

Japanese: Two stern trawlers (probably doing exploratory fishing) worked off Pacific Northwest during January. Their greatest effort was off Washington but, at the end of January, one vessel was sighted off Oregon.

OFF CALIFORNIA

Soviet: Most of the 20 Soviet fishing and support vessels reported off California in December 1966 left. During January 1967, only a few vessels fished in that area.

On Jan. 4, 1967, the U. S. Coast Guard conducted a foreign fishing surveillance flight with a California Fish and Game Commission officer aboard. Six Soviet fishing and support vessels were sighted and identified (see table).

The 2 "Maiakovskii"-class stern trawlers built in 1966 are on maiden voyages. The "Ulianovsk" is the oldest stern trawler and the only "Pushkin"-class vessel operating in the Pacific (23 other Pushkins operate in the Atlantic). The "Fedor Krainov" is the 150th Maiakovskii-class stern factory trawler constructed by the USSR in her shipyards.

The base ship "Arman" was located at the entrance to Santa Barbara Channel, between Point Conception and the St. Miguel Island, about 120 miles northwest of Los Angeles. Two large stern trawlers were lying close to base ship; a third stern trawler was observed about 15 miles south of Point Conception--she was the only one of the 6 sighted believed fishing. The remaining 2 stern trawlers were within a few miles of the base ship.

No Soviet vessels were sighted during the next 10 days but, by mid-January, 1 stern trawler (BMRT) was sighted. By month's end, 3 BMRTs were spotted: 2 about 15 miles off Half Moon Bay, and 1 about 19 miles off Farallon Islands. One vessel reportedly had rockfish on deck.

IN NORTHWEST ATLANTIC

Soviet: For the second consecutive month, no Soviet vessels fished on Georges Bank and

Name	Type	Class	Gross Tonnage	Built (Year)
Arman	Base Ship	Severodvinsk	10,000	Poland (1961)
Ulianovsk	Stern factory trawler	Pushkin	3,000	W. Germany (1956)
Amursk	Stern trawler	Maiakovskii	3,200	USSR (1961)
Suifun	"	"	"	"
Fedor Krainov	"	"	"	"
Boris Gorinskii	"	"	"	(1966)
				"

vicinity. During January 1966, about 50 fishing and support vessels were sighted there.

The best available information indicates that, during January, 30-40 vessels were concentrated on Grand Banks off Canada.

Late in January, U. S. fishermen reported several Soviet factory stern trawlers widely scattered south of Long Island, N. Y. (Hudson and Block Canyon), probably exploring.

There appears little doubt that the Soviets gradually will resume fishing in those areas.



DECLARE A DIVIDEND WITH SEAFOODS

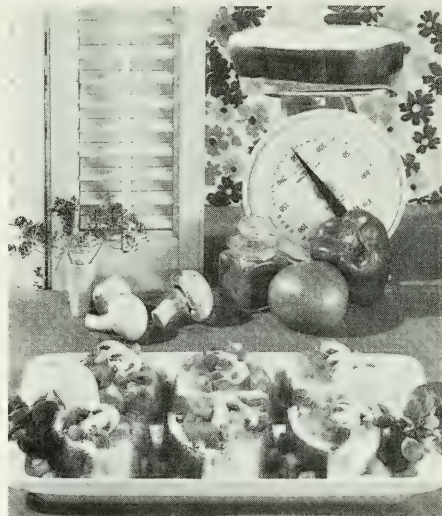
Fish and shellfish offer a netful of dividends for the dieter because they are low in calories, but high in protein, minerals, and vitamins so essential to good nutrition. Dieting is easy with seafoods; they have so much to offer—endless variety in color, flavor, and texture; quick to fix; and real eating enjoyment. Seafoods are good any day of the week for any meal of the day.

North Pacific halibut steaks are topped with mushrooms, garden-fresh tomatoes, green peppers, onions, and a dash of pimiento and parsley. Over this pour a blend of white wine, lemon juice, and dill before baking to a golden brown. This unusual seafood treat, Hearty Halibut, is a dill dandy. Only 230 calories per serving, too!

HEARTY HALIBUT

2 pounds halibut steaks or other fish steaks, fresh or frozen	$\frac{1}{2}$ cup dry white wine
$\frac{2}{3}$ cup thinly sliced onion	2 tablespoons lemon juice
$\frac{1}{2}$ cups chopped fresh mushrooms	1 teaspoon salt
$\frac{1}{3}$ cup chopped tomato	$\frac{1}{4}$ teaspoon dill weed
$\frac{1}{4}$ cup chopped green pepper	$\frac{1}{8}$ teaspoon pepper
$\frac{1}{4}$ cup chopped parsley	Lemon wedges
3 tablespoons chopped pimiento	

Thaw frozen steaks. Cut into serving-size portions. Arrange onion in bottom of a greased baking dish, 12 x 8 x 2 inches. Place fish on top of onion. Combine remaining vegetables and spread over top of fish. Combine wine, lemon juice, and seasonings. Pour over vegetables. Bake in a moderate oven, 350° F., for 25 to 30 minutes or until fish flakes easily when tested with a fork. Serve with lemon wedges. Serves 6.



Hearty Halibut is from a new, 16-page, full-color, diet booklet just released by the United States Department of the Interior's Bureau of Commercial Fisheries. This publication, Seafood Slimmers, is available for 25¢ from the Superintendent of Documents, Washington, D. C. 20402.

ARTICLES

They found enough tuna to support commercial fishing. The plane was more effective than vessel in search for tuna schools.

AN AIRCRAFT AND VESSEL SURVEY OF SURFACE TUNA SCHOOLS IN THE LESSER ANTILLES

By Albert C. Jones* and Paul N. Sund**

Scientists of BCF's Tropical Atlantic Biological Laboratory studied the distribution of surface tuna schools in the waters adjacent to the Lesser Antilles Islands in February-April 1966. It was part of the laboratory's investigation of the biology and ecology of tunas in the tropical Atlantic Ocean.

Observations of the location, size, and species composition of the schools were made from BCF's research vessels "Undaunted" and "Geronimo"--and from an aircraft piloted by a professional tuna spotter. An important part of the study was to determine whether the ability to locate tuna schools could be increased by using a plane along with a research vessel. In this report, we compare the results obtained from the ship and the plane and discuss the efficiency of a survey in which both participate.

Aerial scouting for pelagic fish is used in many parts of the world (Iversen, 1963; Marty, 1965). Land-based aircraft are employed by the U. S. commercial tuna seining fleet to

scout for tuna schools and give detailed directions for setting purse seines (Broadhead and Marshall, 1961; Broadhead, 1962). Float planes and helicopters also have been used. Some vessel operators believe that assistance from aircraft is well worth the cost.

The ocean bordering the Antillean region, from Puerto Rico to Trinidad, was surveyed for surface tuna schools from the Undaunted between Feb. 26 and March 18, 1966 (figs. 1 and 2). Oceanographic data were collected at least three times each day. The vessel traveled about 80-90 nautical

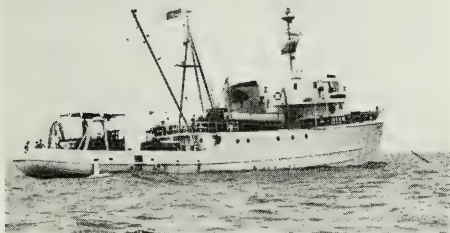


Fig. 1 - BCF's Undaunted. (Photo by Jossi, TABL.)

*Fishery Biologist

**Oceanographer

Note: Contribution No. 38

Tropical Atlantic Biological Laboratory, BCF, Miami, Florida.

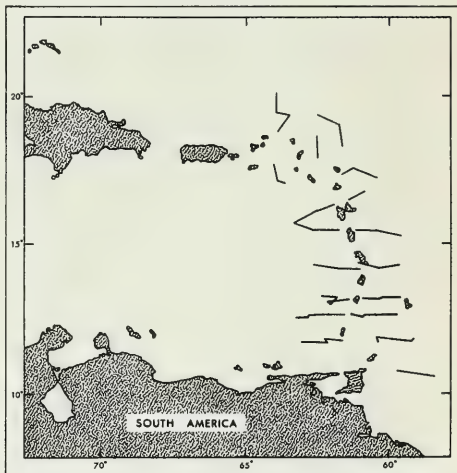


Fig. 2 - Lesser Antilles, showing daily cruise tracks of the Undaunted, February 26-March 18, 1966.

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Fish and Wildlife Service
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miles each day along a straight transect line. Individual transect lines, representing successive days' surveys, were spaced at 45-60-mile intervals. The St. Vincent-Grenada portion of the area was again surveyed from



Fig. 3 - Cessna-180 used during tuna survey.

the Undaunted March 26 to April 1, and from the Geronimo, April 2 to 14. During these two periods, the transect lines were spaced at 15- to 20-mile intervals.

A Cessna-180 aircraft was operated along with the Undaunted from February 26 to March 28 (fig. 3.). The plane was flown in a pattern used for search and rescue work (U. S. Coast Guard, 1963) (fig. 4). While the vessel sailed a straight track, the plane flew along a parallel track pattern perpendicular to the vessel's. The lengths of the plane's transect lines were adjusted so that the plane crossed above the vessel at approximately $\frac{1}{2}$ -hour intervals. At average speeds of 10 knots for the vessel and 97 knots for the plane, it proved practical to fly 15 minutes (24.2 nautical miles) along the long leg of the flight pattern and 3.5 minutes (5.7 nautical

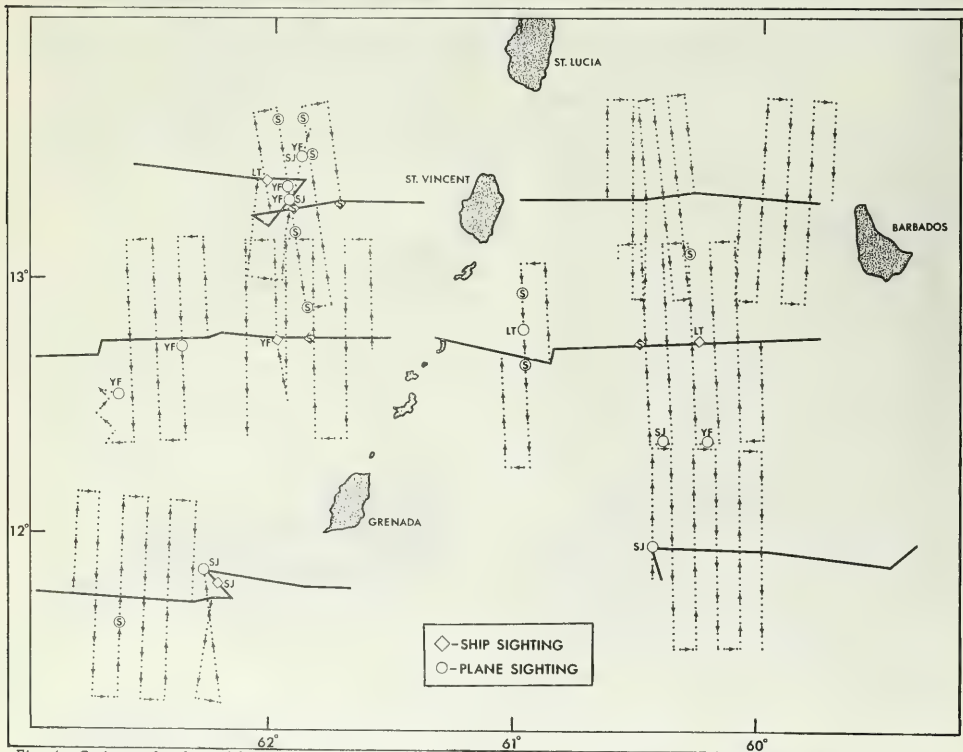


Fig. 4 - Cruise tracks of vessel (—) and plane (---) and sightings of pelagic fish schools, March 11-17, 1966. The 6 solid lines represent daily vessel tracks. YF, yellowfin school; SJ, skipjack school; LT, little tuna school; S, unidentified sighting.

miles) along the short leg. The plane usually flew at 1,500 feet.

DISTRIBUTION OF FISH AND BIRDS

No schools of tuna or other pelagic fishes were sighted from the ship or plane in 11 days of scouting (February 26-27, March 1-2, 4-10) from Puerto Rico to St. Lucia. Trolling yielded 5 little tuna (*Euthynnus alleteratus*) and one yellowfin tuna (*Thunnus albacares*); evidently, they were isolated individuals, not part of schools. Chumming and additional trolling failed to produce increased catches.

Larger numbers of fish were observed off the southern Lesser Antilles from St. Lucia to Trinidad. Ship and plane personnel sighted tuna and other pelagic fishes 27 times in 6 days of scouting (March 11-13, 15-17) (fig. 5). Yellowfin tuna or skipjack tuna (*Katsuwonus pelamis*) or both, were seen 20 times; unidentified species of tuna or billfishes were seen 7 times.

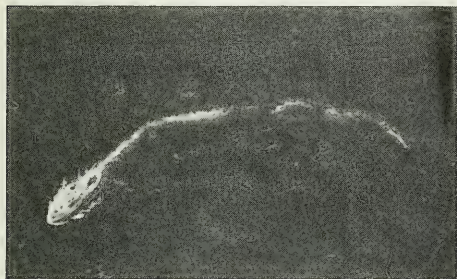


Fig. 5 - Photograph of mixed yellowfin and skipjack tuna school, estimated size 20 tons, and the Undaunted photographed from 1,300 feet altitude, March 15, 1966.

Sightings indicated a greater abundance of tunas on the west side of the southern Lesser Antilles than on the east side. Fourteen tuna schools were recorded on the west side of St. Vincent and Grenada on March 11, 15, and 16,

compared with six on the east side on March 12, 13, and 17 (fig. 4). Both yellowfin and skipjack tuna schools were seen in each area. Four sightings of unidentified pelagic fishes were made on the west side and three on the east side of the islands.

Later, west of St. Vincent and Grenada, 52 tuna schools were seen in 18 days (March 26-28; March 31-April 14). Skipjack tuna were most abundant in schools estimated at 15 to several hundred tons each. Yellowfin tuna were in schools estimated at 15 to 50 tons per school. Some schools contained a mixture of yellowfin and skipjack tunas. Size of skipjack ranged from 4 to 35 pounds and yellowfin 33 to 154 pounds. Identifications were made either from captured fish or from observations at close range (from the vessel) and through binoculars (from vessel and plane). The tonnage estimates, made by experienced tuna fishermen aboard the research vessel, were corroborated by the spotter pilot. The resource appeared sufficiently large to support commercial fishing. Several fish schools behaved in a manner that would make them potentially available to commercial fishing by either live-bait or purse-seine methods. Fishing from the research vessels was by the live-bait method.

Sooty terns (*Sterna fuscata*) were seen frequently; frigate birds (*Fregata magnificens*), boobies (*Sula* spp.), noddy terns (*Anous* spp.), and tropic birds (*Phaethon* spp.) also were present. The terns, frigate birds, and boobies often were associated with tuna schools. Sightings of birds and tunas were more numerous on the west than on the east side of St. Vincent and Grenada. During March 11-17, 33 flocks of more than 10 birds each were seen on the west side of the islands, compared to 17 flocks on the east side.

The greater abundance of tunas and birds west of the Lesser Antilles was associated with differences in the biological and physical features of the ocean environment (table).

Physical and Biological Features of the Oceanic Environment on the East and West Sides of the Southern Lesser Antilles Islands, March and April 1966

Feature	West of Islands	East of Islands
Number of tuna schools observed	14 (3 days)	6 (3 days)
Number of bird flocks ¹ observed	33 (3 days)	17 (3 days)
Depth of mixed layer (meters)	40-100	70-150
Average rate of C-14 uptake (g. C/m. ² /day)	0.048 (4 stations)	0.025 (3 stations)
Average zooplankton displacement volume (ml./1,000 m. ³)	177 (14 stations)	72 (4 stations)
¹ /More than 10 birds.		

The mixed surface layer was shallower on the west side of the island chain than on the east. Primary productivity, measured as the rate of uptake of carbon isotope C-14, was nearly twice as much on the west as it was on the east side; the average displacement volume of zooplankton was about $2\frac{1}{2}$ times higher.

EFFICIENCY OF SEARCH

The distance at which tuna schools or birds associated with tuna schools can be detected visually varies widely. Behavior of the animals, weather conditions, and the observer's experience are critical factors. Under ideal weather conditions, an experienced observer aboard a vessel may detect a school of tuna "breezing" at the surface up to 3 miles away. A bird flock may be seen from 5 miles away.

Visibility of surface-schooling fish is better from a plane than from a ship because the observer is higher; under ideal conditions, fish schools may be seen 5 to 8 miles away. From a plane birds can be seen up to about 1 mile; birds are difficult to see because their dark dorsal surfaces blend with the color of the sea. Birds seen from a vessel are more visible because they are silhouetted against the sky. Unfavorable weather and sea conditions affect visibility from both surface and air, but certain spotting difficulties are less troublesome to spotters in a plane. For instance, from an aircraft fish schools and surface ripples ("wind spots") are easier to tell apart than they are from a vessel.

The areas searched by the plane and ship were compared by assuming an effective visibility limit for each. For ease in computation, this limit was assumed to be that distance beyond which the number of targets detected was equal to the number missed within the limit (U. S. Coast Guard, 1963). In this survey, weather conditions and the state of the sea surface limited visibility to less than maximum distances. The sea was usually choppy (sea state 3-5) and whitecaps were numerous. The visibility limit of fish schools from the ship was approximately 1 mile and of bird flocks approximately 4 miles. From the plane, the scouting distance for fish and bird flocks was estimated conservatively at 1 mile, primarily because of the sea state. All flying was below the elevation of the lowest clouds.

Plane and ship tracks crossed at intervals of about $33\frac{1}{2}$ minutes; in that time, the ship traveled 5.7 miles and the plane 54.1 miles. Under the above assumptions for visibility, the maximum areas effectively searched for fish in each interval were 11.3 square miles (vessel) and 108.2 square miles (plane). The maximum areas searched for birds were 45.4 square miles (vessel) and 108.2 square miles (plane). These values indicate that the plane should have encountered, on the average, about 9.6 times more fish schools and about 2.4 times more bird flocks than the Undaunted. The ship's personnel often located fish schools by first locating bird flocks and then approaching the flocks to determine whether fish schools were present. Under this searching technique, the plane would be expected to encounter only 2.4 times as many schools as the vessel.

The sightings of fish schools from the plane and the vessel were compared for the area from St. Lucia south to Trinidad in March 11-17. In March 26-28, when the plane scouted randomly for fish schools, it was not possible to compare the areas surveyed. In 6 days (March 11-13, 15-17), 8 vessel sightings of pelagic fishes and 19 plane sightings were recorded. In the same period, 24 bird flocks of more than 10 birds and 22 smaller flocks were seen from the Undaunted. Twenty-six bird flocks of more than 10 birds and 49 smaller flocks were sighted from the plane.

The survey indicated that the plane was more effective than the vessel in searching for surface tuna schools. The numbers of fish schools and bird flocks seen from the plane were 1 to $2\frac{1}{2}$ times greater than those seen from the Undaunted. The actual ratio of small flocks of birds seen from the plane, compared to those sighted from the vessel (2:2), was close to the expected ratio (2:4). The ratio for fish schools seen (2:4) was less than the expected ratio (9:6). Much of the time, however, vessel personnel depended on flock sightings to indicate the location of schools of fish under the hovering birds. The ratio for large flocks of birds seen (1:1) suggests that these flocks were visible from the vessel for a greater distance than assumed in the theoretical calculations.

Use of the plane broadened the geographical area that could be searched within a given period. Its use increased the likelihood of sighting concentrations of fish, since tuna schools (and bird flocks) often are aggregated in certain oceanic areas because of favorable environmental conditions.

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SPACECRAFT SURVEYS AID OCEANOGRAPHIC STUDIES

An intensive study of GEMINI photographs taken over a number of oceanic and coastal areas has revealed that they are of significant value to ocean scientists. A scientist of the U. S. Naval Oceanographic Office, Suitland, Md., stated in a recent paper that large-scale oceanographic features observed in outer-space color prints may aid scientists in correcting charts, tracking river effluent, and detecting shoal areas.

Among other possible applications for spacecraft in oceanography are ice surveillance, sea state measurements, and mapping of currents. Radar, infrared, and passive microwave devices would be used in such work.

The scientist said that a few years ago the words "spacecraft" and "oceanography" were incompatible. Today, however, the combination of outer space and inner depths is no longer considered a fantasy. The Naval Oceanographic Office has been working on such a program since October 1965.

A summary shows that oceanographers may have both scientific and economic reasons for turning to spacecraft. Earth-orbiting satellites provide a means of constantly surveying remote areas such as the Arctic, Antarctic and South Pacific. More frequent coverage of the world's oceans could also be obtained and a new global perspective provided. These factors would lead to a better understanding of oceanic phenomena.

The scientist pointed out that two-thirds of a satellite's orbiting time is spent over the ocean. Aircraft flying across large water masses have already proven that valuable scientific data can be gathered remotely.

THE SUBTROPICAL UNDERWATER OF THE EASTERN GULF OF MEXICO

By Reed S. Armstrong*

The R/V "Geronimo," Bureau of Commercial Fisheries, Galveston, Tex., occupied 20 hydrographic stations over the continental slope off the Florida Gulf coast between June 30 and July 13, 1966. One purpose of the cruise was to examine the SUW (Subtropical Underwater), which is characterized by a subsurface salinity maximum. This water enters the Gulf of Mexico through the Yucatan Channel and is the major component of the upper waters over a large portion of the Gulf.

The predominant features in July were the extensive penetration of the SUW into the part of the Gulf surveyed and the presence of an intense core far to the north (figs. 1 and 2). The circulation of the SUW can be deduced from the topography of the salinity maximum layer (fig. 3). In the eastern portion, a flow to the south southeast is indicated. A clockwise curvature prevails in the north producing an area of convergence and a deepening of the water, thereby increasing the persistence of the high-salinity core. Another clockwise curvature is apparent in the southern part of the sampling area.

The circulation in the eastern Gulf of Mexico has by no means been established, but what now seems to be one of the best representations was prepared by Drummond and Austin, 1958¹). They showed a tongue-shaped flow entering the Gulf through the Yucatan Channel, spreading out through all the eastern Gulf, and then exiting through the Florida Straits. Superimposed on this flow was a separate, clockwise-circulating cell in the northeast Gulf--and another clockwise cell off the western tip of Cuba. Presumably, these gyres and those noted from data gathered from the Geronimo are the same. Our information indicates, however, that the area of the northern gyre is at times more restricted.

About a month after the Geronimo cruise, the R/V "Alaminos" (Texas A&M Research Foundation) cruised in the eastern Gulf of

Mexico (August 4-18, 1966). Waters with salinity maximums >36.4 p.p.t. (parts per thousand) were encountered at 43 stations in the eastern Gulf. The water of 36.7-p.p.t. salinity (to the north) was a separate cell and its center was at least 83 km. southwest of its position during the Geronimo cruise (fig. 4). The high-salinity water (>36.6 p.p.t.) in the south (fig. 2) was displaced to the south about 110 km. by the time of the Alaminos cruise.

The circulations deduced from the topography of the salinity-maximum layer (fig. 5) indicate that these waters were associated with clockwise rotating gyres. Also, the depth of the 36.7-p.p.t. salinity water in July (northern gyre) was about 15-25 m. less than the depth at the same location in August. The depth to the 36.6-p.p.t. salinity cell, however, was about the same in July as in August.

The significant question concerns the cause for the change in position of the gyres over the month period. The possible causes are:

1. Varying intensity of flow entering the Yucatan Channel.--This explanation requires a stronger flow into the Gulf during July to produce a greater penetration and greater volume of SUW in the Gulf. The results would be to push the 36.7-p.p.t. water and the northern gyre farther north, and the southern gyre farther northeast in July than in August.

This assumption could explain the southern gyre. In the northern gyre, however, the greater flow would deepen the SUW. It should have been at a deeper level in July than in August, but the opposite occurred.

2. Waters with different salinity characteristics were entering the Gulf in the two periods.--This possibility requires that water of 36.7 p.p.t., or greater, salinity was entering the Gulf before the July cruise and that less saline water was introduced before the August period. Thus, the 36.7-p.p.t. salinity

*Research Oceanographer, BCF Biological Laboratory, Galveston, Texas.

¹Drummond, Kenneth A., and George B. Austin, Jr.: Some aspects of the physical oceanography of the Gulf of Mexico, 1958. U.S., Fish and Wildlife Serv., Spec. Rep. 249, pp. 5-13.

Note: This is Contribution No. 224, BCF Biological Laboratory, Galveston, Tex.

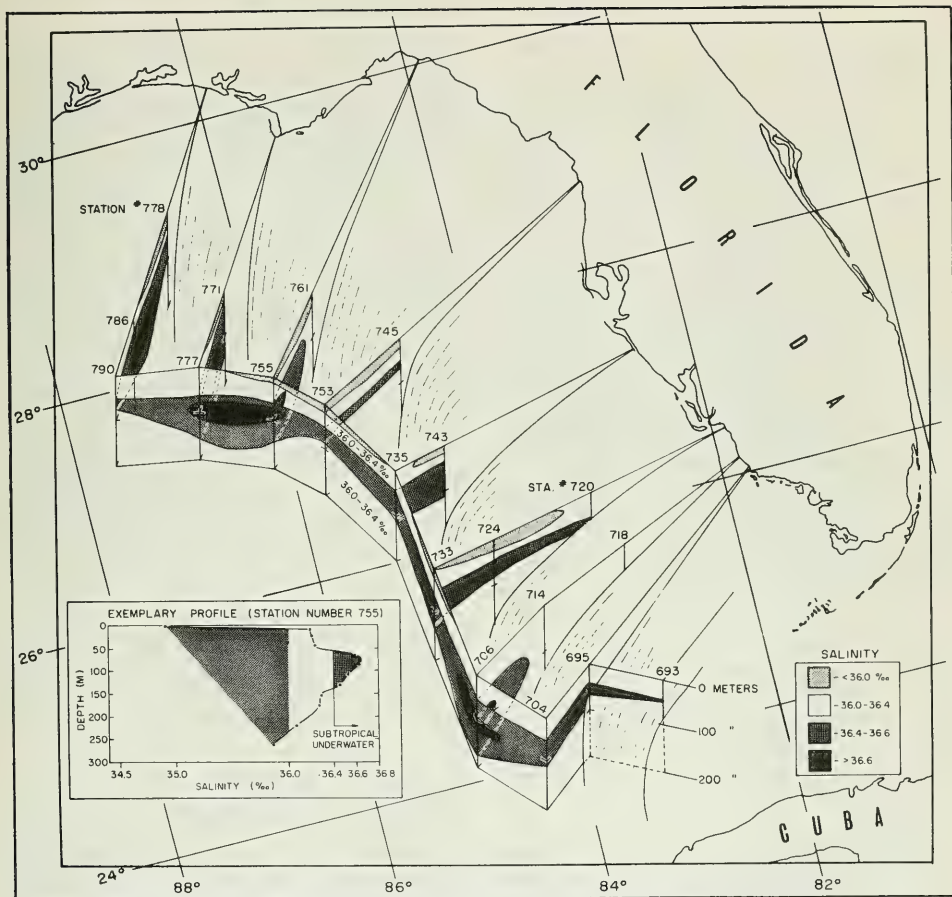


Fig. 1 - Three-dimensional salinity distribution from cruise 9 of the R/V "Geronimo" (June 30-July 13, 1966).

water would have covered a more extensive area in July and would have been "eroded" somewhat by August.

This concept is supported by the presence of low-salinity (<36.6 p.p.t.) water, which apparently entered the Gulf during early August. Water of such varying salinity would probably enter the Gulf as isolated bubbles.

This concept alone does not account for the changes in the circulation that took place in the northeastern part of the Gulf between July and August.

3. Different configuration of the flow pattern.--It is probable that in the oceans the flow pattern at any moment does not necessarily follow the pattern of the mean flow. Rather, both direction and speed of currents vary from time to time. As information continues to collect, such conditions seem to be the more typical state of the system. This explanation, combined with concept (2), can describe the changes encountered in the two cruises.

4. Isolated cells which move about.--This explanation would be a specific form of the variations discussed in (3) above. It is con-

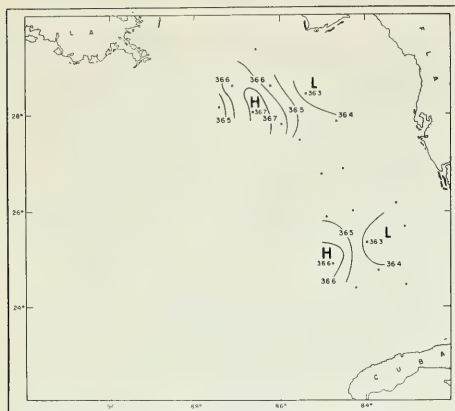


Fig. 2 - Value of salinity maximum in p.p.t. (parts per thousand) Subtropical Underwater from cruise 9 of R/V Geronimo.

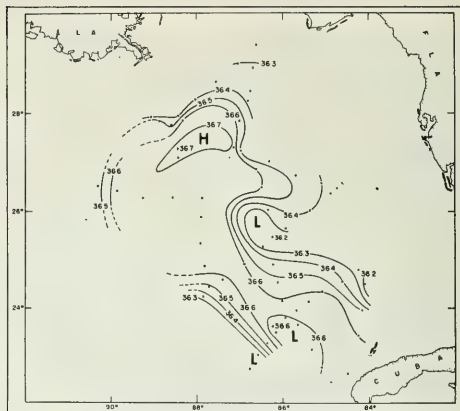


Fig. 4 - Value of salinity maximum in p.p.t. (Subtropical Underwater) from cruise 66 of R/V "Alaminos" (August 4-18, 1966).

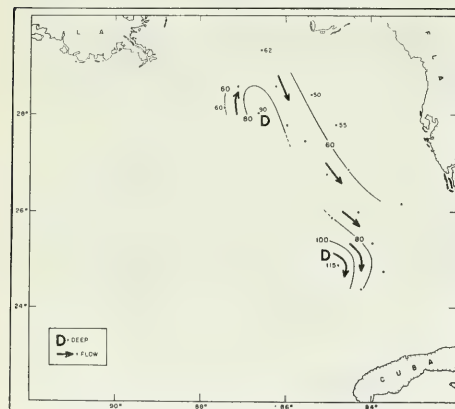


Fig. 3 - Depth to salinity maximum layer in meters (Subtropical Underwater) from cruise 9 of R/V Geronimo.

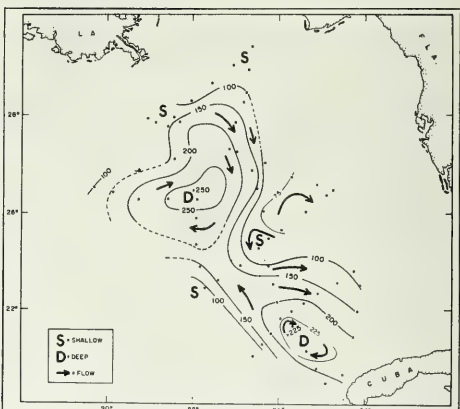


Fig. 5 - Depth to the salinity maximum in meters (Subtropical Underwater) from R/V Alaminos cruise.

ceived that the northern clockwise rotating gyre is accelerated northward by the main flow, hits the continental slope, and bounces southward toward the main flow. This possibility also seems to fit the data of the Geronimo and Alaminos cruises--particularly because, as the gyre moves northward, the clockwise motion should decrease and the depth to the salinity maximum in the gyre should also decrease. It is significant that when this gyre is located over the continental slope, the northern portion is over the shelf

and, because of the circulation, this would be an area conducive to upwelling.

It is apparent from these data that flow in the oceans is not in a steady state, but varies considerably in time. The forces producing the currents are changing, and changing at a rate greater than the time required for steady-state motion to develop. The transfer of these forces through the waters can be likened to a pulsating system.

EXPERIMENTAL REARING OF POSTLARVAL BROWN SHRIMP TO MARKETABLE SIZE IN PONDS

By Ray S. Wheeler*

The commercial fishery for several species of penaeid shrimp along the south Atlantic and Gulf of Mexico coasts is the most valuable fishery in the United States. In 1965, fishermen were paid about \$82 million--a value exceeding that of Pacific salmon, the shrimp's nearest rival, by 22 percent.

Landings in the United States consist almost entirely of shrimp taken in nets towed by trawlers on the near-shore fishing grounds. Although similar techniques are used by foreign fishermen, their production is not limited to this method. In India, for instance, culturing of shrimp in ponds has developed to a point where production of whole shrimp amounts to more than 1,000 pounds per acre (Menon, 1954¹).

In the United States, efforts to rear shrimp in ponds to marketable size have been primarily experimental and attempted by only a few organizations. The BCF Biological Laboratory, Galveston, Tex., began studies in 1964 to determine the feasibility of culturing shrimp under seminatural conditions.

In March and May 1965, postlarval brown shrimp (*Penaeus aztecus* Ives) were collected at the entrance of Galveston Bay with fine-mesh nets and stocked in each of 2 shallow $\frac{1}{8}$ -acre, brackish-water ponds built in December 1964.

Two rearing methods were used. In one pond, shrimp were fed a prepared diet, and filtered sea water was pumped through the pond at a rate of 60 gallons per minute. During a 95-day period, shrimp showed continuous growth and attained an average length of 97.4 mm. (about 106 tails per pound); the projected production was 234 pounds per acre.

In the second pond, commercial fertilizer was applied to stimulate plankton growth, and the water was maintained in a static condition. During a 4-month period, shrimp attained an average length of 80.0 mm. (about 200 tails

per pound) and had a projected production of 45 pounds per acre.

Coefficients of condition showed that shrimp held in the circulating-water pond maintained, in general, a good state of relative well-being; those held in the static-water pond could not.

METHODS AND MATERIALS

Each pond is 100 feet by 50 feet by 4.5 feet and positioned so that the long axis is aligned with the prevailing east-west wind to improve water circulation and aeration (fig. 1). In addition, each pond is connected to a lagoon by a 10-inch, concrete-asbestos composition pipeline fitted with a standpipe in the pond to control water level.

Water was supplied to each pond from the adjacent laboratory building with a 2-inch polyethylene pipe. Before entering the pond, however, all water was filtered through crushed oyster shell (fig. 2) to prevent the introduction of predators. Clogging of these shell filters (one for each pond) necessitated frequent changing.

Shrimp were reared by a different method in each pond. In the static-water pond, only small amounts of water were added to compensate for loss through evaporation and seepage. Food was provided by adding fertilizer to promote the growth of plankton. In the circulating-water pond, there was a constant exchange of water, and shrimp were fed a prepared diet.

Young or postlarval brown shrimp (*Penaeus aztecus*), averaging 14 mm. ($\frac{1}{2}$ inch) in total length (tip of the head spine or rostrum to the tip of the tail or telson), were stocked in both ponds. Before stocking, they had been separated by hand from accompanying organisms, counted, and acclimated to the pond by introducing water slowly (over a 10-minute period) from the respective ponds into the containers holding them. On the basis of an arbitrary

*Fishery Biologist, BCF Biological Laboratory, Galveston, Texas.

¹/Menon, M. K.: On the paddy field prawn fishery of Travancore-Cochin and an experiment in prawn culture. 1954. Proc. Inco-Pac. Fish. Council, 5th sess., sec. II: 1-5.

Note: This article is Contribution No. 228, BCF Biological Laboratory, Galveston, Tex.

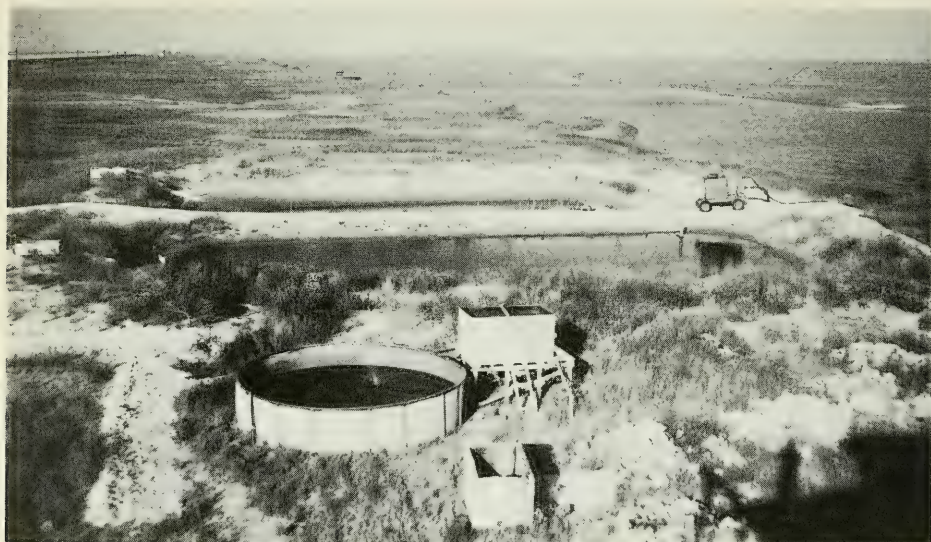


Fig. 1 - $\frac{1}{8}$ -acre ponds used for rearing shrimp.

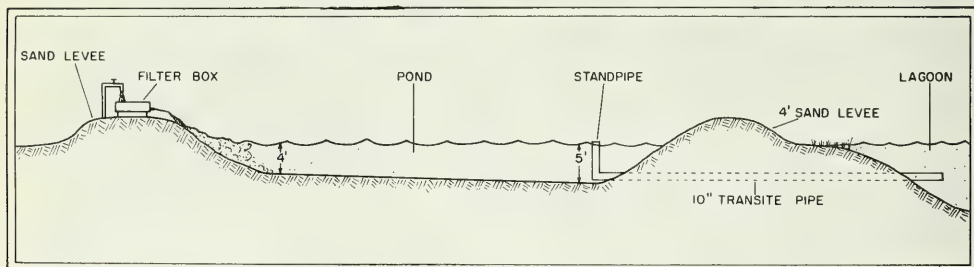


Fig. 2 - Cross section of pond showing location of filter box and standpipe.

estimate of 25-percent survival, and a production goal of 1,000 pounds of whole shrimp per acre, we stocked 9,000 shrimp in each pond. Three weeks after stocking and, weekly thereafter, 40 shrimp from each pond were weighed, measured, and returned to the pond. In the static-water pond, chlorophyll *a* measurements were made periodically from surface-water samples to check the effect of fertilizer on the growth of phytoplankton.

GROWTH AND PRODUCTION

1. The Static-Water Pond

On March 26, 12 days before stocking the postlarvae, the researchers made an initial

application of 160 pounds of soluble inorganic fertilizer with an NPK (nitrogen, phosphorus, potassium) ratio of 3:2:1. An additional 25 pounds of fertilizer (NPK ratio of 4:2:1) were applied on April 9, 2 days after stocking.

Two days after the initial application, a plankton bloom characterized by a slight green coloration was evident. On April 19, the chlorophyll *a* density was 73.0 mg./l. (milligrams per liter), a value 35 times greater than that in the adjacent lagoon. The water was pea green and a mat of algae had formed on the bottom along the pond's edge.

By April 21, the green color of the water began to fade. Fertilizer was added to restimulate plankton growth—but failed. The bloom disappeared by April 23, leaving the water clear and the bottom lined with a heavy deposit of black organic matter that had the distinctive odor of hydrogen sulfide. All postlarval shrimp had died. However, later tests in which shrimp were held in aquaria with similar concentrations of fertilizer indicated that the fertilizer had not caused the shrimp mortality.

On May 3, the pond was emptied, flushed, and refilled. Residual fertilizer^{2/} in the bottom sediments was sufficient to produce an algal bloom in which the chlorophyll *a* content ranged from 2.3 to 6.4 mg./l.—values about twice that in the adjacent lagoon.

About 6,500 postlarval shrimp were stocked in this pond on May 6 and held 4 months. Shrimp growth during this period is shown in figure 3.

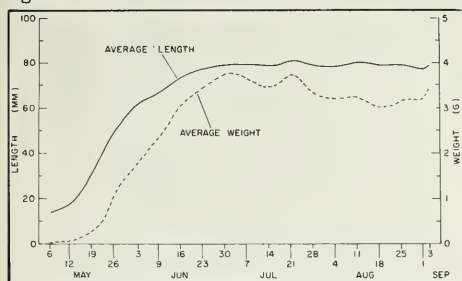


Fig. 3 - Shrimp growth, expressed as average lengths and weights, in the static-water pond over a 4-month period.

In 55 days, shrimp attained an average length of 79.7 mm. (3.1 inches) and average weight of 3.7 grams (0.130 ounce), or about 120 whole shrimp per pound. Average growth rates per day were 1.2 mm. (0.05 inch) in length and 0.7 gram (0.002 ounce) in weight. However, from the beginning of the 3rd month, and for 7 weeks, shrimp exhibited no appreciable increase in length, and showed a statistically significant loss in weight.

When the study was terminated in September, 5.6 pounds of whole shrimp having a tail count of about 200 per pound were removed from the pond. Projection of this value gives an estimated yield of about 45 pounds per acre.

^{2/}Four days after refilling, a chemical analysis of water samples from the pond and the lagoon showed the total phosphate content to be 8.20 and 2.85 µg. at./l. (microgram atoms per liter), respectively.

2. The Circulating-Water Pond

Water was circulated at a rate of 60 gallons per minute (an amount equal to about one complete exchange of water every 48 hours); the shrimp were fed daily a prepared diet of ground fish and shellfish (64 percent by weight) mixed with commercially produced livestock food (36 percent by weight). Results are shown in figure 4.

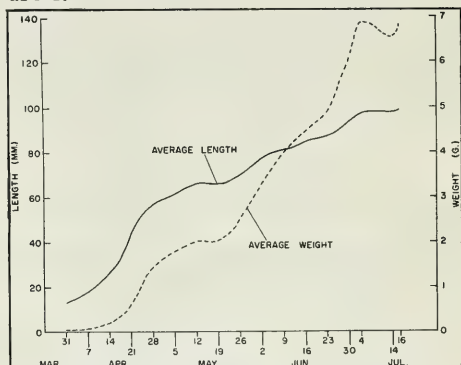


Fig. 4 - Shrimp growth, expressed in average lengths and weights, in the circulating-water pond over a 3-month period.

In 3 months, shrimp grew to an average length of 97.4 mm. (3.8 inches) and weight of 6.9 grams (0.243 ounce), or about 66 whole shrimp per pound. Although weekly growth rates varied, daily increases during this time averaged 0.9 mm. (0.04 inch) in length and 0.073 grams (<0.003 ounce) in weight.

This study was unexpectedly terminated 95 days from the date of stocking. On July 4, shrimp were observed concentrating near the source of inflowing water and crawling out on the banks of the pond. Suspecting low dissolved oxygen, attempts were made to increase water circulation (and thus oxygen) by pumping in more water with a 4-inch pump and agitating the pond water with an outboard motor. The attempts proved only partially successful, however, for when the pond was drained on July 16, only 231 shrimp remained.

After the July 4 kill, 25.7 pounds of dead shrimp (1,696 shrimp averaging 97.4 mm. in length and having a tail count of about 106 per pound) were removed from the pond banks and

water's edge. All dead shrimp were not recovered, however, because the pond was not immediately drained. Projection of the combined weights of dead and surviving shrimp showed a yield of 234 pounds of whole shrimp per acre in a 95-day growing period.

CONDITION OF SHRIMP IN THE TWO PONDS

Although the initial attempts to rear shrimp under semi-natural conditions were not fully successful, sufficient length-weight data were obtained at weekly intervals to compare the coefficient of condition (K) of the shrimp in the two ponds (fig. 5). This factor (K) expresses relative well-being and robustness of shrimp; it is derived by the formula:

$$K = \frac{1,000,000 W}{L^3}$$

where W = weight in grams and L = length in millimeters.

The difference in condition of the shrimp reared in the two ponds is readily apparent.

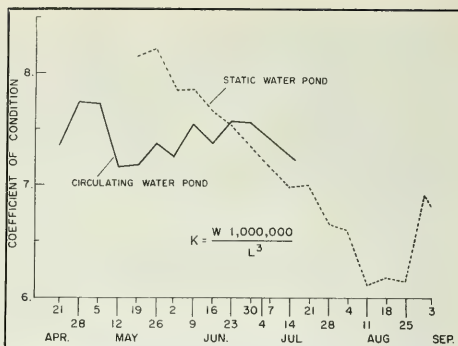


Fig. 5 - Weekly variations in the relative well-being and robustness of shrimp reared in the static- and circulating-water ponds.

Shrimp held in the circulating pond maintained, in general, a good state of relative well-being, whereas those held in the static-water pond did not.



Created in 1849, the Department of the Interior—America's Department of Natural Resources—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.



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FISH NUTRITION

Here is a well rounded story on the nutritive qualities of fish.

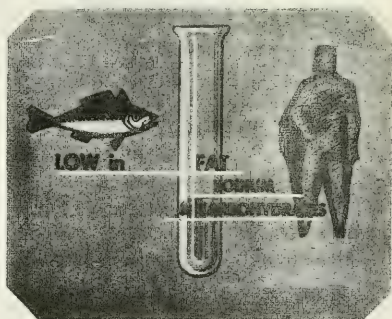
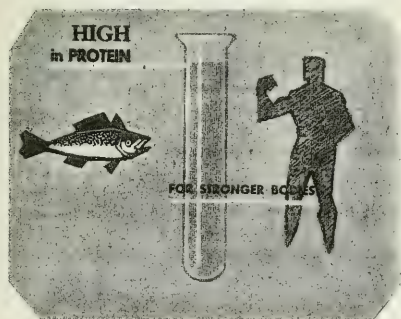
The average American eats only about 10 pounds of fish a year, according to the U. S. Bureau of Commercial Fisheries. Japanese and the Scandinavians eat four times as much. Only about 50 percent of all the fish caught in the United States is used for food.

Nutritionally speaking, fish have much in their favor:

1. Most fish are 18-20 percent protein, about the same as meat and the protein is of a very high quality.

2. Most varieties are low in fat--less than 1 percent--thus being moderately low in calories. Fish such as cod, haddock, ocean perch, flounder, and sole supply only about 80 calories (1 gram of fat and 18 grams of protein) for every 3- to 3½-ounce serving.

3. The varieties with more fat in them have an important characteristic. Fish oil is a highly unsaturated oil and compares favorably with some vegetable oils in its ability, under certain conditions, to lower the level of cholesterol in the blood. Moderately fat fish (2-5 percent), such as trout, pickerel, catfish, bluefish, halibut, swordfish, supply about 125 calories per serving. The so-called high fat fish (8-15 percent) are still fairly modest in calories. Mackerel, salmon, sardines, pompano, herring, average from 180 to 200 calories for each serving. These "fat" fish also have a considerable amount of vitamin A.



4. Shellfish--oysters and clams in particular--are good sources of iron.

5. Fish with soft bones which you can eat such as sardines and canned salmon are high in calcium and fluorine, the tooth decay-preventing mineral nutrient.

In spite of all these attributes, as a nation, we aren't much interested in fish. The chief problems seem to be:

1. Many people think fish must be fresh to be enjoyed. Better freezing methods are making it possible for the Middle West in particular to have a steady supply of high-quality fish.

2. Fish has been designated in most minds as "Friday" food.

3. Unless fish is prepared with care and imagination, it can be pretty dull stuff. The flavor is monotonous. But fish prepared with a judicious use of herbs and a gentle touch is a real gourmet delight.

Fish makes nutritional sense. And economy is a factor; many types of fish will fit almost any budget.



UNITED STATES DEPARTMENT OF THE INTERIOR
STEWART L. UDALL, SECRETARY

STANLEY A. CAIN, ASSISTANT SECRETARY,
FISH AND WILDLIFE AND PARKS

CLARENCE F. PAUTZKE, COMMISSIONER,
FISH AND WILDLIFE SERVICE

HAROLD E. CROWTHER, ACTING DIRECTOR
BUREAU OF COMMERCIAL FISHERIES

FDA REQUIREMENTS FOR FISH PROTEIN CONCENTRATE (FPC)

In approving "whole fish protein concentrate" as a food supplement (additive) on February 2, 1967, the Food and Drug Administration specified that the following "prescribed conditions" be met:

1. The FPC is made from "whole, wholesome hake and hake-like species handled expeditiously and under sanitary conditions. ..."

2. It "consists essentially of a dried fish protein processed from whole fish. ...It is prepared by solvent extraction of fat and moisture with isopropyl alcohol or with ethylene dichloride followed by isopropyl alcohol; solvent residues are reduced by conventional heat drying and/or microwave radiation; and there is a partial removal of bone."

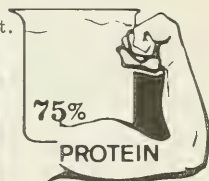
3. FPC meets these specifications:

- Protein content is not less than 75 percent by weight of final product.

- Moisture content is not over 10 percent by weight.

- Fat content is not above 0.5 percent by weight.

- "The additive may contain residues of isopropyl alcohol and ethylene dichloride not in excess of 250 parts per million and 5 parts per million, respectively, when used as solvents in the extraction process."

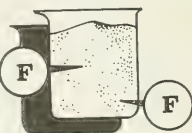


- Microwave radiation not over 25 kilowatts in power "may be used to reduce residues of the solvents used in the extraction process." The frequency of the electronic equipment used must be approved by the Federal Communications Commission.

- The FPC shall not have more than 100 parts of fluorides in a million parts of FPC.

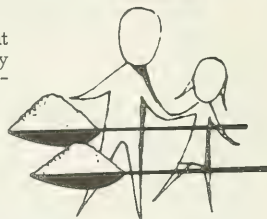
- The FPC shall be free of disease-carrying organisms or viruses.

- It shall have "no more than a faint characteristic fish odor and taste."

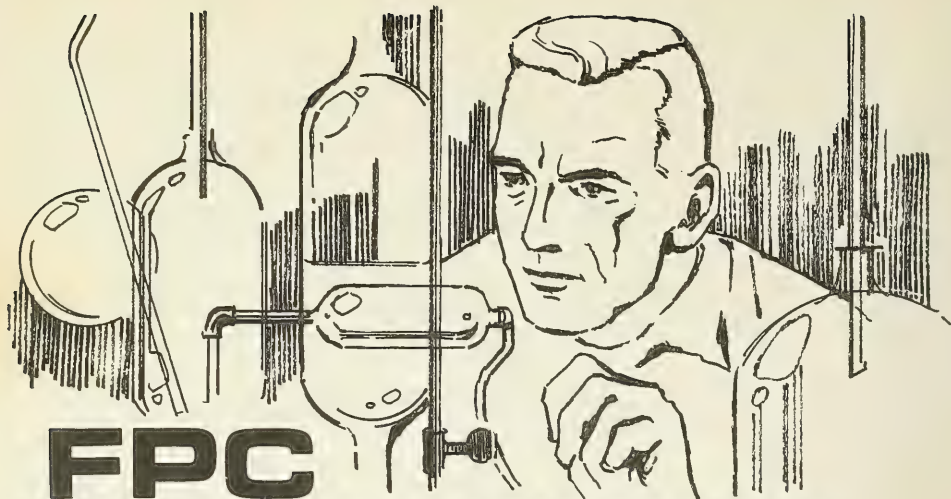


4. It is used "only in the household as a protein supplement in food." Children under 8 years who consume FPC regularly should not consume over 20 grams per day. (Twenty grams produce a heaping tablespoon.)

5. The FPC "is packaged in consumer-sized unit not exceeding 1 pound net weight."



6. The label shall bear the name of "whole fish protein concentrate," and adequate, readily understood directions that comply with limitations in No. 4 above.



FPC

FISH PROTEIN CONCENTRATE

This inexpensively produced food supplement, high in animal protein, has been developed through the concerted efforts of scientists and industrial men of many nations working to alleviate the malnutrition of millions of the world's peoples.

The many qualities of FPC give rise to many uses. It can be produced in the form of a tasteless, odorless flour, or as a soluble powder in a wide variety of flavors.

In addition to its major value as a dietary supplement for the alleviation of malnutrition, FPC could be utilized advantageously for military, civilian defense, and space rations, where compactness is essential.

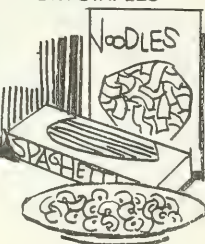
The potential for existing and new markets and industries is very promising. The U.S. fishing industry will welcome the stimulus provided by the introduction of FPC manufacture and begin to exploit many untapped resources such as, for example, the HAKE, a fish which abounds in our coastal waters.

Shipbuilding, distribution, packaging, and many other industries will also greatly benefit by the development of . . .

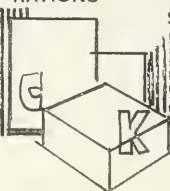
BREADS



DRY STAPLES



RATIONS



SOUPS



FPC

COMMERCIAL FISHERIES *Review*

VOL. 29, NO. 4

APRIL 1967

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Fishes



COVER: Fishermen in the racks catching one-pole yellowfin tuna from a surface school. In the central Pacific, such schools of small fish are found near islands.

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.



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The grouper in the basket on the head of a woman is being carried to a market in India. It is the woman's total inventory for that day.
(Photo: FAC)

U. S. FISHERIES: THE 1966 RECORD

U. S. fishermen caught 4,341 million pounds of fishery products in 1966 that sold for \$454 million--the highest dollar value in the industry's history. The catch was worth nearly \$8 million more than 1965's and was 20 percent above the previous 10-year average. Volume was 435 million pounds--9 percent less than 1965's and the smallest catch since 1953. (Record catch: 5,345 million pounds in 1962.)

The lower volume reflects the serious decline in menhaden landings. The catch dropped from 1.7 billion pounds in 1965 to only 1.3 billion pounds in 1966--a decrease of 416 million pounds or 24 percent. In 1965, menhaden were 36 percent of the total U. S. catch; in 1966, only 30 percent. Other important species landed in less volume in 1966 were tuna, jack mackerel, Pacific and Atlantic sea herring, yellowtail flounders, shrimp; and, to a lesser extent, Pacific mackerel, mullet, scup, sea bass, whiting, blue crabs, oysters, and sea scallops.



Fig. 1 - "Clean" catch consisting predominantly of pink shrimp.

On the brighter side, there was a record catch of king crabs and significantly greater catches of Pacific salmon, the best since 1949.

Increased landings of alewives, anchovies, and Dungeness crabs helped to offset the total decline.

The high average price per pound of the 1966 landings, despite the smaller catch, resulted from a smaller proportion of low-price industrial species and significantly higher prices paid to fishermen for food fish. Fishermen received a record average of 10.5 cents per pound, compared with 9.3 cents in 1965. Smaller volumes in 1966 of tuna, flounders, Atlantic sea herring, Atlantic ocean perch, scup, whiting, northern lobsters, and shrimp gave fishermen more money than larger landings of these same species in 1965.

Processing Industry Had Good Year

The billion-dollar U. S. fishery processing industry gained substantially and most segments enjoyed a profitable year. There was a record pack of tuna, an excellent pack of salmon, and increases in packs of Maine sardines, clam products, alewives, and tunalike fish.

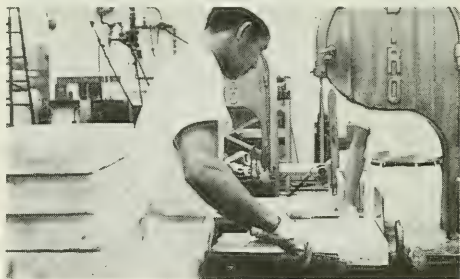


Fig. 2 - Production of breaded fish portions at Blue Water Seafoods plant. A series of cuts with high-speed saws turns blocks into uniform portions desired.

Canned fishery products were worth a record \$551 million. The remarkable fish stick and portion industry established volume and value records--production was 228 million pounds worth nearly \$100 million. Processors of breaded shrimp produced well over 100 million pounds to set a record worth nearly \$100 million. Producers of fresh and frozen fillets had a relatively good year. The volume of groundfish fillets, as expected, was less, but other types of fillets were produced in record volume. Firms preparing fish and shellfish specialty dinners and other packaged

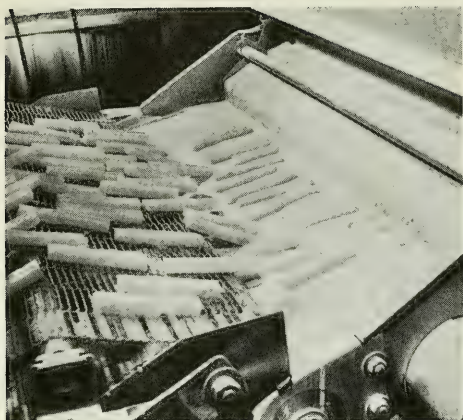


Fig. 3 - Fish sticks passing from batter to breading.

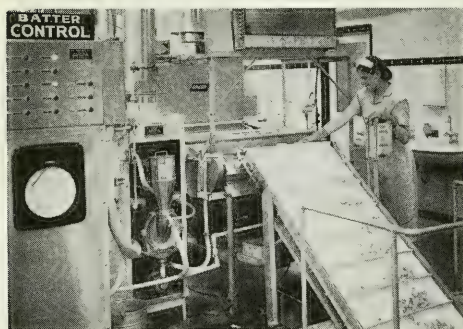


Fig. 4 - Frozen scallops about to be battered and breaded at Gorton.

fish and shellfish products also had a good year; all the records point to the spectacular growth of this industry in 1966.

The high dollar value paid to fishermen and the substantial gains of the processing industry were overshadowed by the marketing problems facing segments of the fishing industry at the end of 1966. Imports and domestic cold-storage holdings of fillets and blocks increased steadily in 1966. Despite BCF monthly statistical data forewarning the fishing industry, the accumulation of stocks continued to the year's end. Then, stocks of canned seafood were about 25 percent greater than at the end of 1965. The problem of heavy

holdings--canned and frozen--was compounded by the purchase of supplies at high prices.

RECORDS SET (Old Records in Parentheses)

CATCH

Total value: \$454 million (1965: \$445 million.)

Crabs, king: 158.9 million pounds (1965: 131.7 million).

The World Catch: 115.5 billion pounds (1965: 113.8 billion).

PROCESSED FISHERY PRODUCTS

Value of all fishery processed products: \$1.2 billion (1965: \$1.1 billion).

Tuna, canned: 19,953,567 cases (1965: 18,098,804).

Clams, canned, chowder and juice: 2.0 million cases (1965: 1.9 million).

Fish portions: 146.6 million pounds (1965: 140.5 million).

Breaded shrimp: 104 million pounds (1965: 98.1 million).

Fillets and steaks (other than groundfish): 92 million pounds (1965: 91.7 million).

IMPORTS

Import value: \$724 million (1965: \$601 million).

All fishery products: 8.1 billion pounds, live-weight (1964: 7.5 billion).

Edible fishery products: 2.9 billion pounds, live-weight (1965: 2.6 billion).

Industrial fishery products: 5.2 billion pounds, live-weight (1964: 5.2 billion).

Tuna, albacore, frozen: 180.2 million pounds (1965: 167.5 million).

Tuna, other than albacore, frozen: 208 million pounds (1964: 171.7 million).

IMPORTS (Contd.):

Tuna, loins and discs: 15.2 million pounds (1964: 14.9 million).

Tuna, canned: 61.6 million pounds (1961: 58.7 million).

Groundfish and ocean perch fillets, including blocks and slabs: 315.1 million pounds (1965: 295 million).

Fillets and steaks, other than groundfish: 92.7 million pounds (1965: 74.7 million).

Shrimp: 178.5 million pounds, import weight; 195 million pounds, heads-off basis (1965: 162.9 million, import weight; 179 million, heads-off basis).

Scallops, sea (meats): 16.7 million pounds (1965: 16.5 million).

Oysters, canned: 12 million pounds (1965: 8.6 million).

Sardines, canned: 57.6 million pounds (1962: 52.9 million).

Fish meal and scrap: 447,748 tons (1964: 439,143 tons).

SUPPLY (Domestic production plus imports)

All fishery products: 12.4 billion pounds, live-weight basis (1964: 12 billion).

Edible fishery products: 5.4 billion pounds, live-weight basis (1965: 5.2 billion).

Fillets, groundfish and ocean perch, including blocks and slabs: 390 million pounds (1965: 372.1 million).

Fillets, other than groundfish and ocean perch: 184.7 million pounds (1965: 166.4 million).

Tuna, canned: 455.8 million pounds (1965: 409.4 million).

Shrimp: 340.5 million pounds, heads-off basis (1965: 331.3 million, heads-off basis).

OTHER IMPORTANT FACTS

Louisiana led all states in volume: 664.1 million pounds, followed by Alaska: 588

OTHER IMPORTANT FACTS (Contd.):

million; California: 474.9 million; Massachusetts: 412.5 million; and Virginia: 418.4 million.

Alaska led all States in value: \$74 million, followed by California: \$53.3 million; Massachusetts: \$45 million; Texas: \$42.7 million; and Louisiana: \$39.8 million.

Shrimp was the most valuable item: \$95.8 million, 21 percent of total paid for all species and 43 percent above second most valuable item, Pacific salmon.

The Bureau of Customs reported 816 vessels obtained documents as fishing vessels--the largest number since 1949. Of this total, 551 vessels were built in 1966 for commercial fishing, and 68 were completed in 1965 but did not obtain documents until 1966. There were 197 older vessels converted to fishing in 1966.

The 404.8 million pound salmon catch was the largest since 1949; the pack of canned salmon (4.3 million cases) was the largest since 1952.

Landings of Atlantic cod, Pacific sardines, and oyster meats were the lowest on record. Atlantic sea herring landings were the smallest in 25 years; sea scallop meats, since 1946; Atlantic ocean perch, since 1939; and menhaden, since 1951.

For the 18th consecutive year, San Pedro led domestic fishing ports in catch value--\$33.6 million.

Foreign vessels, principally Russian and Japanese, intensified operations off U.S. coasts. While these fleets were taking more fish and shellfish on the high seas off the U.S., this nation's catch on high seas off foreign coasts declined from 464 million in 1960 to 369 million in 1966.

Peru was the world leader in landings in 1965 followed by Japan, China (Mainland), USSR and the U.S. In 1966, the USSR took 6 million metric tons of marine products and approached their fishery goal. Norway's catch increased

OTHER IMPORTANT FACTS (Contd.):

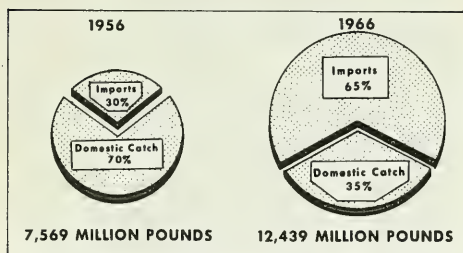
sharply in 1966 and may drop the U. S. to sixth place.

Japan led all nations in per-capita consumption of fishery products: 54.7 pounds of edible meat, followed by Sweden: 47 pounds; Norway: 44.5 pounds; China (Taiwan): 31.3 pounds; and the Philippines: 32.8 pounds. Annual per-capita consumption of fishery products in the U. S. was 10.6 pounds of edible meat.

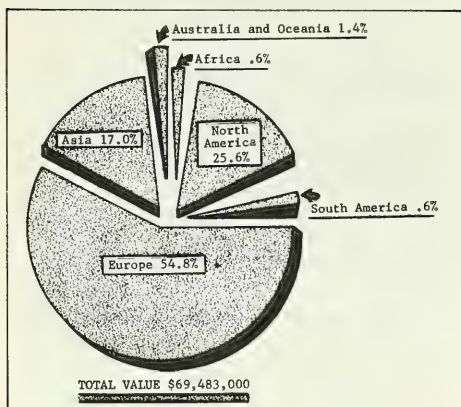
The number of fishery cooperatives in the U. S. was 102 in 1966. Members operated or owned 7,514 fishing craft.

During the 89th Congress, a number of legislative actions affecting commercial fisheries became public law. The most important measures extended the U. S. fishing limit from 3 to 12 miles (P. L. 89-658); authorized Department of the Interior to develop practicable means of producing fish protein concentrate (FPC) for human consumption (P. L. 89-701); created "sea-grant" colleges by amending 1966 Marine Resources and Development Act (P. L. 89-688); seek to control or eliminate jellyfish and other such pests (P. L. 89-720), protect and conserve North Pacific fur seals and sea otters on high seas (P. L. 89-702), and will set up a national oceanographic study to recommend coordination of numerous existing Federal programs (P. L. 89-454).

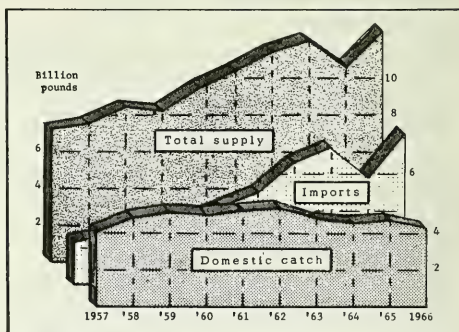
(Abstracted from "Fisheries of the United States, 1966," prepared by Branch of Fishery Statistics.)



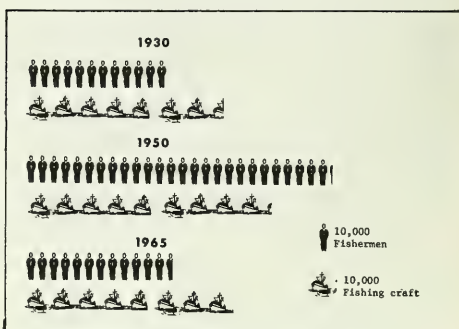
Domestic supply of fishery products increased 64 percent since 1956.



Value of U. S. exports to continent of destination, 1965.



U. S. supply of fishery products, 1957-66 (round weight basis).



Number of fishermen and fishing craft, 1930, 1950, and 1965.

U. S. OCEAN POLICY PROPOSED BY NATIONAL ACADEMY OF SCIENCES

The rapid growth of ocean science and ocean use during the past 8 years has produced enough knowledge and manpower to support a significantly larger national oceanographic program. During these years, the Federal budget for oceanography has grown from \$21 million in 1958 to \$221 million in 1967. So reports the National Academy of Sciences/National Research Council (NAS/NRC) in "Oceanography 1966 Achievements and Opportunities," a 183-page publication of its Committee on Oceanography.

The need for a national policy is underscored by the fact that the U. S. has not maintained a leading role in some uses of the ocean. And in 2 former major marine industries--fisheries and merchant marine--it has slipped.

The U. S. dropped from third to fifth place in total fish catch since 1958.

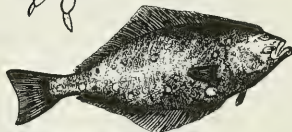
In the past 15 years, the world's merchant marines doubled in tonnage--while the U. S. merchant marine decreased.

NAS/NRC makes clear: "The purpose of the present report is to take stock of the current status of oceanography and to reassert or extend the recommendations made in our earlier report" ("Oceanography 1960 to 1970," summary chapter published in 1958, now out of print).

NAS/NRC'S 3 MAJOR RECOMMENDATIONS

NAS/NRC advises: "To reap the benefits from full and effective use of the ocean and its resources, it is necessary for use of the ocean to be concurrent with our gain of knowledge of the ocean. A national ocean policy should aim both toward increasing the extent of knowledge and toward developing the abilities that will enable us to go anywhere and do anything in the ocean that is, or may prove to be, beneficial.

"The national ocean policy should not only establish the national goals with respect to the science and use of the ocean, but it should also indicate the rate at which the goal is to be pursued. The national ocean program and budget should be based on this national ocean policy."



To carry out these purposes, NAS/NRC recommends that the U.S. should adopt: 1(a) a comprehensive national ocean policy to increase understanding and use of the ocean "at as rapid a rate as is consistent with other national goals"; (b) a program to implement that policy; and (c) a budget large enough to pay for the program.

2. The budget should reflect the relationship among various parts of the program; for example, "between discipline-oriented and mission-oriented research activities." Discipline-oriented activities seek primarily to advance ocean science as a field of knowledge. "Their purpose is to increase understanding of oceanic phenomena in physical, chemical, geological, or biological terms, including the 'how' and 'why'."

Mission-oriented programs seek to solve practical problems faced by an agency in meeting its public responsibilities. "The problems may be in defense, exploiting fish or mineral resources, protecting public health, developing recreational facilities, or providing seismic sea-wave or hurricane warnings."

3. Revise and strengthen the existing management structure for the national oceanographic program to improve "planning, coordinating, and budgeting functions."

SPECIFIC RECOMMENDATIONS

NAS/NRC makes the following specific recommendations to carry out a national ocean policy:

Marine Resources

The attention now being given to broad and basic problems concerning living resources should be continued. Studies on nonliving resources should be accelerated.

Food: Continue the development and use of processes for making fish protein concentrate (FPC) and other new products for human consumption.

Fisheries: Increase the research on the transfer of materials through the food chain and on the dynamics of exploited fish populations. Study the institutional obstructions to fisheries development--economic, legal, and others.

Minerals: Continue the development of techniques to extract minerals economically from the sea floor.

Studies on Marine Organisms: In the next 10 years, provide 4 new laboratories to study the survival requirements of young fish and shellfish. As a start, "one large-oceanarium-scale facility for fish-behavior studies" is needed.

Radioactive Wastes

The funds for basic research on the effects of artificial radioactivity on the marine environment should receive a 20% step increase.

Columbia River Studies: Continue the studies on the distribution of radioactive materials in the coastal marine environment near the Columbia River's mouth to follow changes in distribution that will result from decreases in the strength of the source.

Movement and Mixing Processes: Continue the studies of the movement and mixing of a contaminant into estuarine and coastal waters. Strongly increase the efforts in the open sea.

Routes, Rates, and Reservoirs: Studies are needed of the "natural rates of input of the elements to the sea, the distribution of elements in each reservoir, and the rates of transfer between various reservoirs, particularly for the trace elements."

Biological Transport of Elements: Strengthen studies of the distribution of stable trace elements in the biota (the fauna and flora of a region) and in the nonliving reservoirs to determine the importance of biological transport.

Effect of Radiation on Genetics: Continue the studies of radiation-produced damage to form and structure of marine organisms (morphological damage) and begin studies on genetic effects.

Biological Field Studies Utilizing Radioisotopes: Conduct studies of the mutual relations between organisms and their environment (ecological studies) in estuarine and coastal environments "wherever new low-level introduction of radioactive materials produces measurable amount of artificially introduced activity in the biota."

NEARSHORE WASTE DISPOSAL

There should be research and development studies to make possible multiple use of the nearshore zone for purposes that now often conflict--recreation, fisheries, aquaculture, waste disposal, production, kelp harvesting, and transportation.

Municipal and Industrial Wastes: Study estuarine and coastal waters on the effects of increased levels of nutrients--and changes in the balance of major and minor nutrients--on the rate of primary production, standing crop, the variations in species among the primary producers, and indirect changes higher up in the food chain.

Pesticides and Herbicides: Interior Department's Water Pollution Control Administration and Bureau of Commercial Fisheries and State agencies should support research on the effects of pesticides and herbicides on marine organisms nearshore and on the high seas.

OCEANWIDE SURVEYS

Conduct a program of deliberate and planned surveys (SEAMAP) of the open ocean, using systematic and standardized methods, which would lead to the production of charts and atlases encompassing the World Ocean. Continue the efforts to establish a worldwide navigation system with an accuracy of 0.1 nautical mile. A single system should cover the offshore areas of the U. S. up to at least 100 miles "with an uncertainty of about 100 ft. or less." The SEAMAP program needs additional shore facilities.

OCEAN ENGINEERING

"Ocean engineering data and information should be assembled and published systematically."

LONG-RANGE WEATHER FORECASTING

A global observation system should be established. "Further work should be done on numerical prediction models, extensive investigations should be carried out on basic problems of turbulent boundary-layer transport and small-scale interactions with large-scale motion." Special studies should be made of the coupling between circulations in the tropics and higher latitudes.

OCEANOGRAPHIC SHIPS

About 60 new ships are needed over the next decade. Continue to build ships of improved design to replace conversions and overaged ships. "All noncombatant surface ships used for research, development, or survey should be operated by the laboratory or agency directly concerned."

DEEP MANNED SUBMERSIBLES

"Provide a greatly improved deep-diving replacement" for the "Trieste" for oceanographic research. Build several more small two- or three-man submersibles. Shipboard-handling apparatus should be included in these construction programs.

BUOYS

Continue the work on identifying and correcting the causes of long-term failures of deep-water buoys so that they will last a year or more.

SHORE FACILITIES

An estimated minimum of \$36 million is needed for more new shore facilities from 1966 to 1971. They should provide laboratory space for an increased research program and more scientific personnel entering the marine sciences.

NEW TOOLS AND INSTRUMENTS

"Development of research instruments should be supported in connection with specific research programs by funds to institutions and researchers."

DATA HANDLING, PROCESSING, AND STORAGE

The national Oceanographic Data Center should keep pace with the growing input of data. More effort should go to developing procedures for the automation of data reduction aboard ship. Data from about 5,000 oceanographic stations should be selected and made available as basic information for describing the mean properties of deep water--and to experiment with a "live atlas" or other means of presentation. This computer-compiled oceanographic data will tell a user in minutes the precise and detailed information he wants, e.g., temperature, salinity, oxygen, etc.

EDUCATION AND MANPOWER

Increase the funds for faculty salaries, graduate training facilities, and fellowships and research assistantships to ensure the necessary growth of trained oceanographers. Encourage the development of university training programs in ocean engineering.

FEDERAL ORGANIZATION FOR OCEANOGRAPHY

The Navy: Funds of the Office of Naval Research to support basic oceanographic research should keep pace with the growth of the Navy's oceanographic budget.

Bureau of Commercial Fisheries (BCF): Should provide support through grants and contracts for research projects in fishery oceanography at universities and private research institutions. (See "Interior Awards 18 Oceanography Study Grants," page 24, of this issue.)

Environmental Science Services Administration (ESSA), Institute for Oceanography and Coast and Geodetic Survey: The ESSA budget should include support for grants and contracts for basic research related to its interest. ESSA should expand its cooperative programs with the academic community.

Department of State: Should help to facilitate research-ship operations throughout world through exchange of information and speeding the movement of persons, equipment, and supplies. There should be closer liaison between ship cruise-planners and State's scientific officers--and more such officers assigned to marine programs.

INTERNATIONAL COOPERATION

The U.S. should help other countries develop national oceanographic programs. There should be more emphasis on surveys of marine resources and on training programs and research projects related to greater use of proteins from the sea by developing nations.

Federal agencies should give long-term support to research and educational activities in the marine sciences that will be carried out cooperatively by U. S. institutions and developing centers of marine sciences throughout the world.

"A world oceanographic organization should be established within the United Nations to provide a single home for the various marine scientific and technological activities now lodged in several branches of the United Nations and its specialized agencies."

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The 183-page NAS/NRC report costs \$5 and is available from: Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Ave. NW., Washington, D. C. 20418.

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Committee on Oceanography

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UNITED STATES

U. S. Selects Northwest as Site for FPC Plant

The Federal Government's first pilot-scale demonstration plant to make fish protein concentrate will be located in the Pacific Northwest, Secretary of the Interior Stewart L. Udall has announced. The exact location will be announced after more study. Target date for completing the plant is spring 1968. BCF now is conducting preliminary engineering studies.

The plant will be designed to demonstrate how practicable it is to manufacture fish protein concentrate. It will aid private firms by providing a basis for the design and construction of larger commercial plants.

Funds totaling \$1,000,000 to build it--and \$700,000 to operate and maintain it and conduct research--are included in the President's 1968 budget. Appropriations to construct one plant and lease another were authorized in November 1966 and waited on approval of fish protein concentrate by the Food and Drug Administration.

President Johnson has urged the development of FPC to proceed "on an urgent basis."



New Lined Carton to Transport Fishery Products

A Boston (Mass.) firm is manufacturing new types of containers for efficient and economical transport of fish and shellfish by land, sea or air. The containers consist of a foam plastic liner in an outer corrugated carton. They are claimed to have a high strength-to-weight ratio, excellent thermal insulation, outstanding shock absorbency, good moisture retention, and chemical inertness; they reduce packaging costs, eliminate damage, and are light for shipping purposes.

The foam plastic liner boxes are made in 3 sizes: (1) for shipping fresh fish fillets, about 20 x 12 x 4 inches; (2) for shipping lobsters, shellfish, and bulk packs of fish fillets,

about 21 x 13 x 14 inches; and (3) a jumbo box designed to carry 60 pounds of live lobsters, which nests for storage, measures about 21 x 16 x 14 inches.

Special Container for Lobsters

To keep lobsters in perfect condition, the firm recommends packing them in jumbo containers with fresh seaweed and 1 or 2 of their firm's reusable ice packs. The packs consist of 1½ or 3 pounds of frozen chemical gel in a tough polythene bag; the refrigerating properties are said to equal 5 times their weight of ice, last longer, and also are cleaner and more convenient.

The ice packs can be used many times. The manufacturers say the containers are being used increasingly by shippers in Boston, Washington, California, and Alaska to pack live lobsters for Midwestern cities and Europe. ("Fishing News International," Jan. 1967.)



1966 Lake Michigan Alewife Landings Are Double 1965's

The 1966 Lake Michigan alewife production of 29 million pounds doubled the 1965 landings and is expected to double again this year. The primary reasons are the new Menominee meal plant, which has contracted to buy the production of several new Lake Michigan trawlers, and more pound-net fishing operations in the Green Bay (Wisc.) area.

Pet food fish-freezer capacity also is being increased over fivefold in southeast Lake Michigan. A Chicago pet-food processor, who uses 60 tons of fish a day, plans to bring a Gulf of Mexico trawler for test fishing operations.

BCF's Ann Arbor exploratory fishing staff is actively aiding this burgeoning industry.



Oceanography

SCIENTISTS DETECT CERTAIN GRAY WHALE SOUNDS FOR FIRST TIME

Marine scientists now have "conclusive evidence" that gray whales emit unique sounds other than those from locomotion and feeding, reports the U. S. Navy Electronics Laboratory (NEL), San Diego, Calif. William C. Cummings, an oceanographer in the laboratory's Listening Division, discloses that "week-long, around-the-clock studies off the San Diego coast in 1966 and 1967 show that gray whales produce distinctive, low frequency, moan-like sounds." These sounds--50 to 200 cycles a second and about $1\frac{1}{2}$ seconds long--are in the frequency range of bass clef on the piano. Previously, many researchers believed gray whales did not make the sounds many other whales do.

Cummings also reported that gray whales continue their migration to Mexican waters during nighttime.

Some scientists had maintained that gray whales did not migrate at night, or did so under full moonlight when they could see.

How Study Was Conducted

The NEL research yawl "Saluda" was moored in the ocean as a platform for both visual and acoustic observations. Cummings, who was scientist in charge, explained:

"We put hydrophones (underwater microphones) on the ocean bottom. One hydrophone was located to the north of the ship and one to the south. They were separated by 1,000 feet. The distance between the hydrophones was carefully measured so that when signals were received on the two hydrophones we could use the arrival time differences and the signal strength in calculating the position of the sound source."

To aid the study, a small boat sonar mechanism designed to track whales and corroborate visual observations was used.

"Last year, the moan-like sounds were recorded in limited numbers, but were not identified for certain as sounds generated from the gray whale. This year's findings enabled us to positively link this distinctive sound to the gray whale. Another sound recorded from gray whales was from the blow as the whales surfaced, exhaled and inhaled," Cummings said.

Moan-like sounds were not always produced as the whales went by the hydrophones, and the blow sounds were recorded only when they were very close to the hydrophone.

Cummings reported: "Earlier observations have resulted in conflicting data on gray whale sounds. Some investigators were not successful in their attempt to record sounds from gray whales. Others have reported hearing high frequency clicks of the type often associated with echo-ranging. We could not confirm the presence of clicks even though observations were made during darkness and fog when the whale would be likely to employ echo-ranging to supplement its vision."

The gray whale, a baleen whale, sieves plankton from the water. Some baleen whales produce low frequency moans and groans, but never has any echo-ranging, high frequency click been recorded from a baleen type whale.

Nocturnal Migration

At night the whales migrate, Cummings said. "They did so even when there was no moon shining. They also migrated at night when the area was covered by dense fog and human visibility was limited to 125 feet."

The night migration often is revealed by a spectacular display of bio-luminescence, which presumably comes from the luminescent plankton in the water; these light up when disturbed by the whale's swimming movements. Cummings flew over migrating whales at night and could see luminescent trails behind them. "On two occasions I could see the whale from the air in a cigar-shaped area of brightened light," he said. "Consequently we are quite sure these trails were produced by whales."

What possible use could the gray whale make of his low-frequency sound? Cummings suggests that the most likely use is for communication with other whales. It is possible that they also may obtain gross information on the location of large objects--land masses, other whales, ocean bottom, or nearby ships.

"Many toothed cetaceans use high frequency clicks for echo-ranging to obtain information about the environment which they cannot see, and it's possible that grays use a low frequency sound to do the same thing--but on a much more limited scale. Of course, the behavioral significance of these moans is conjecture at this point."

Studies Conducted During Southerly Migration

The studies were conducted in mid-January 1966 and 1967, during the southerly migration of gray whales. Two hundred gray whales were seen during the week-long observations each year.

Cummings said: "One day, at 2 a.m., we were treated to a spectacular display of luminescence caused by a gray whale which came nearly completely out of the water except for its flukes. When the whale splashed down, luminescent spray was sent a good 25 to 30 feet into the air. The whale could be seen surrounded by light."

Study of the gray whale resulted from the Navy's interest in passive sonar and the identification of possible strategic targets.

* * *

U. S. WEATHER BUREAU TO EXPAND MARINE FORECASTS

The U. S. Weather Bureau this year will expand its network of radio stations broadcasting instant marine weather forecasts by adding 15 on the east, west, and Gulf coasts to the 4 now operating. These forecasts are issued on Very High Frequency (VHF) FM broadcasts at 162.55 megacycles. This is not the commercial FM band, but special receivers costing \$25 to \$90 can be purchased. Owners of marine radiotelephones may need only an appropriate crystal in an unused channel to receive continuous-forecast transmission.

The 162.55 megacycle frequency will be standard throughout the U. S. for all Weather Bureau instant weather forecasts. Mariners can use the same receiver in any broadcast territory to pick up the transmission within 40 miles of any network stations.

Atlantic to Pacific Network

The 15 cities scheduled to offer service during 1967 (installation dates will vary) are: Atlantic City, N. J., Boston, Mass., Charleston, S. C., Corpus Christi and Galveston, Tex., Hartford, Ct. (with antenna on Southern Conn. coast), New Orleans and Lake Charles, La., Los Angeles and San Francisco, Calif., Jacksonville, Miami, and Tampa, Fla., Norfolk,

Va., and Washington, D. C. These cities will be in addition to the four at Chicago, Honolulu, Kansas City, Mo., and New York City, where the forecasts have won favorable public reaction.

The broadcasts, strongly oriented toward marine needs, are also designed to provide useful information to the general public. They will consist of overall weather summary, radar weather summary, observations of wind, weather visibility, and sea conditions from reporting stations, and a detailed local and area forecast. One primary purpose will be to provide immediate warnings of squalls, thunderstorms, tornadoes, and hurricanes. Broadcasts will be updated immediately to reflect significant storm activities.

The forecast will be tape-recorded, then played automatically and continuously. Normally it will be updated every 2 or 3 hours, and more frequently during rapidly changing conditions. (U. S. Department of Commerce, ESSA, Feb. 23, 1967.)

* * *

COAST GUARD'S INTERNATIONAL ICE PATROL HAS PREVENTED DISASTER

On April 14, 1912, the great, "unsinkable" liner "Titanic," destroyed herself on an iceberg off Newfoundland. It was her maiden voyage; 1,500 persons died.

There were many memorials--but the most lasting is the operation of the International Ice Patrol, under U. S. Coast Guard direction, now in its 53rd year. The Patrol is the world's most successful international effort to promote safety at sea. The Coast Guard reports that not one life has been lost in North Atlantic shipping lanes due to iceberg collisions since the Patrol's inception in 1914.

Every year since then, except for intervals in the World Wars, Coast Guard ships and aircraft have waged their annual war against the iceberg menace. Now, and throughout the ice season, early March-June or July, ice reconnaissance is carried out by aircraft deployed from their permanent base at Elizabeth City, N. C., to Argentina, Newfoundland. And standing by is the cutter "Acushnet" out of Portland, Maine.



A Coast Guardsman in rear cargo doorway of Ice Patrol plane aims calcium chloride-rhodamine "B" dye bomb at iceberg. The iceberg--in Davis Strait off Baffin Island--is imbedded with bright vermillion stain for future identification and aerial tracking. (Photo: U. S. Coast Guard)

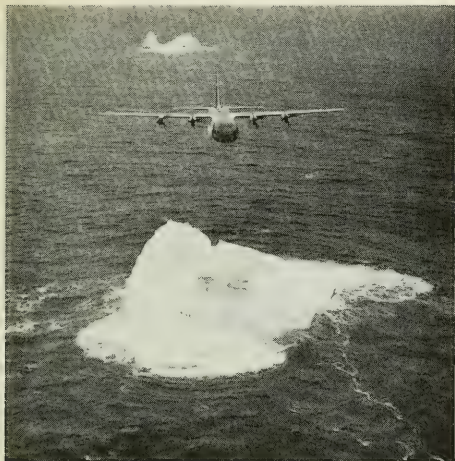


Fig. 1 - Ice Patrol Plane Hedge-Hopping Icebergs--Since World War II, aircraft, not ships, have performed the major part of the Ice Patrol's work of hunting and tracking icebergs. In this head-on view of an HC-130-B "Hercules" Ice Patrol plane, the plane is hedge-hopping a row of icebergs off the Labrador Coast. The berg in foreground was selected for tracking of movements with the currents by marking it with aerially dropped calcium chloride-rhodamine "B" (brilliant red) dye bomb.

(Photo: U. S. Coast Guard)

Patrol Is Increasingly Scientific

The Patrol has assumed an increasingly scientific character. Today, it uses the techniques of modern science to do its job. It watches for floating bergs--and also gathers information on the phenomena of northern waters. It is a basic part of the Coast Guard's expanding, century-old, oceanographic program.

During the 1967 iceberg hunt, oceanographic scientists will attempt to link iceberg detection techniques with weather-satellite photo reconnaissance. The Coast Guard will install a transceiver at Patrol Headquarters in New York, which may be able to receive directly weather-satellite photos of ocean areas covered by the Patrol. This information will be combined with data from planes equipped with radiometric iceberg detectors to provide sharper definition and location of the areas under surveillance. Eventually, the Coast Guard plans to take part in a satellite system that will provide higher resolution for earth phenomena.



Fig. 2 - Ocean Science Important to Ice Patrol Vigilance--The constant study of the ocean currents, which greatly influence iceberg movements, is important to the Ice Patrol's predictions and tracking plots for iceberg seasons. Here, a Salinity Temperature Depth Sensor system is used on the Coast Guard oceanographic vessel "Evergreen" on a mission to determine if the source of the Labrador Current is in the Hudson Strait. The Sensor systems instantaneously record readings of salinity, temperature, and depths down to 1,500 meters.

(Photo: U. S. Coast Guard)

Instrument Can Isolate Berg

The radiometric iceberg detector, developed by Coast Guard and Sperry engineers, "is based on the principle that all matter emits electromagnetic impulses of varying intensity." The detector measures each "signature" and makes it possible to determine whether an object is ice or some other floating object.

Coast Guard oceanographers will continue to study the Gulf Stream and Labrador Currents to understand better these forces that strongly influence the drift of huge ice islands, sometimes as large as office buildings. Also, they will continue to study North Atlantic waters through sampling, salinity measurements, and analysis of marine organisms. As an added surveillance device, the Coast Guard will continue to experiment with large ocea-

nographic buoys to monitor the ocean currents in which they move. Work will continue on marking bergs with brightly colored calcium-chloride "bombs"--to develop a type that will last for a long period and facilitate tracking bergs.

Weather Ships Used Too

The Coast Guard also uses weather ships. During their 3-week patrols in 10-mile-square sectors of the North Atlantic, the cutters transmit weather and other meteorological data to transoceanic ships and planes. They also conduct marine studies. They assist the Coast Guard in its growing effort to describe the water mass exchange between North Atlantic and adjacent waters. They gather valuable data for studying drift patterns and deterioration rates of icebergs. Observations of the Ice Patrol and the ships are processed through a computer and the data will be used to build a dynamic model of the North Atlantic. The model is an integral part of any oceanic prediction system. It is needed to solve the iceberg detection and surveillance problem.

Can the "white monsters" be destroyed? To date, they have resisted fire-bombs, gunfire, and chemicals. Relentlessly, the Greenland glaciers grind their way to the sea, and the bergs detach themselves into the North Atlantic. So far, the Coast Guard says the most practical defense against them is to watch their movements.

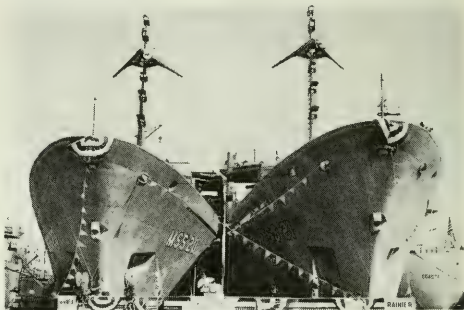
17 Nations Contribute

The 1967 Patrol is a tribute to the foresight of the participants in the First International Safety Conference held at London in 1913. The Conference recommended the formation of an "International Ice Observation and Ice Patrol Service" under U. S. administration. In 1914, the job was given to the U. S. Coast Guard.

At present, 17 nations contribute to the Patrol on a "pay-as-you-benefit" basis: Belgium, Canada, Denmark, France, Germany, Great Britain, Greece, Italy, Japan, Liberia, Netherlands, Norway, Panama, Spain, Sweden, the United States, and Yugoslavia.

TWO SURVEY SHIPS LAUNCHED

Two \$4,000,000 hydrographic survey ships were launched March 15 in Jacksonville, Fla., by the Environmental Science Services Administration (ESSA), U. S. Department of Commerce. The vessels are the USC&GSS "Fairweather" and "Rainier." The 231-foot, 1,627-ton ships are being constructed for ESSA's Coast and Geodetic Survey. They are designed to chart U. S. coastal waters to help provide safe navigation for commercial shipping and recreational boating.



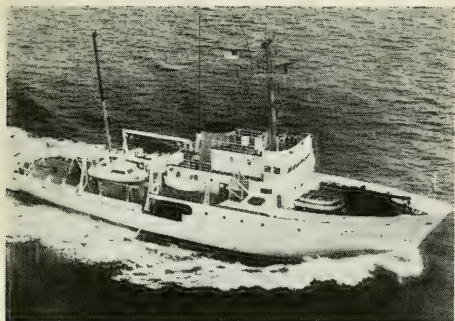
Preparing launching ceremonies for the two new survey ships USC&GSS Fairweather and Rainier. (Photo: ESSA)

The ships are scheduled to be completed later this year. Another vessel of the same class, the USC&GSS "Mt. Mitchell," was launched November 1966 and also will be completed this year. The 3 vessels will replace others being retired.

The Fairweather and Rainier will have welded steel hulls strengthened for navigation in ice. Each will be propelled by twin-screw diesel engines through reversible-pitch propellers controlled either from the engine room or the bridge. The engine room will be monitored via a centralized automated system. A bow thruster will facilitate better ship control while on station or when docking. Each ship will be equipped with the latest electronic, depth recording, and positioning equipment.

"DAVIDSON" COMMISSIONED

A new hydrographic survey ship, the USC&GSS Davidson, of ESSA was commis-



New hydrographic survey ship USCGC Davidon. (Photo: ESSA)

sioned March 10. The 175-foot, 996-ton vessel brings to 14 the number of hydrographic survey, ocean survey, and wire drag ships in ESSA's fleet.

The ship was launched at Norfolk, Va., last May 7. She is designed for hydrographic coastal surveying, including the setting up and support of shore parties, and also has limited oceanographic facilities.

The Davidon is equipped with specialized depth recorders and positioning systems. She is built of welded steel construction strengthened for navigation in ice and will be propelled by diesel engines, with twin-screw, controllable-pitch propellers. The vessel has accommodations for 6 officers and 30 crew.

The Davidon is a sistership of the USCGC GSS "McArthur," commissioned in December 1966 at Norfolk.

* * * *

MARINE TECHNOLOGY SOCIETY TO MEET IN JUNE

The Marine Technology Society (MTS) will hold its 3rd Annual Conference and Exhibit in San Diego, Calif., June 5-7, 1967. The theme: "The New Thrust Seaward."

The Conference will have 11 technical sessions of 60 papers on Federal, state, and regional aspects of oceanography; navigation and oceanography; minerals and mining; man-in-the-sea; undersea materials; power sources; deep submergence; physical oceanography; and unmanned ocean systems.

Note: For more information contact Charles W. Covey, Suite 1000, 1117 N. 19th Street, Arlington, Va. 22209.



Foreign Fishing Off U. S. Coasts, February 1967

IN NORTHWEST ATLANTIC

Soviet: After a nearly 2½-month absence, the fleet resumed fishing off New England and New York. Soviet fishing this year began late in January. U. S. fishermen reported several stern trawlers conducting exploratory operations. Several days later, on Feb. 1, a small fleet of 16 factory stern trawlers and 2 support vessels was sighted in a concentrated area south of Montauk Point, Long Island (Hudson and Block Canyons). Moderate catches of fish consisted primarily of red hake and small amounts of whiting (silver hake). General servicing of the stern trawlers by support vessels was also noticed.

On Feb. 15, 1967, 33 Soviet fishing (21 stern trawlers, 9 medium trawlers) and support vessels were sighted 80-120 miles south of the Long Island-Cape Cod coast. They were widely dispersed on the edge of the Continental Shelf. The fleet was divided into 2 parts: one--11 factory stern trawlers--was engaged in what appeared to be a limited fishery for red hake. Small catches were observed on only 2 vessels; on others, the crews were repairing trawl gear. This part of the fleet was about 85 miles south of Montauk Point, Long Island, N. Y., on the western border of ICNAF's subarea 5 (71°29' W.).

The second fleet also was fishing for red hake, to the east of the first one (69°33' W.). It consisted of 10 stern trawlers and 9 medium side trawlers. Moderate to heavy catches were observed in the open storage areas on deck.

There was little or no evidence of whiting (silver hake) among the catches. Crewmen of the large side trawlers were bagging fish in sections of netting. Bags already filled and lashed together were heaped on deck for delivery to a nearby factory base ship of the "Pionersk" class, recently constructed for the USSR in Poland.

Dehydration plants were working on many stern trawlers.

No vessels were sighted outside the ICNAF Convention area.

During February, 41 individual vessels were sighted and identified as 25 factory stern trawlers, 9 large refrigerated side trawlers, 2 medium side trawlers, 3 refrigerated fish transports, 1 factory base ship, and 1 tanker.

The Soviets appeared at least moderately successful in the red hake fishery. But their fleet was less than half of the over 90 vessels reported in February 1966, so it is almost certain that total red hake catches are far below those of February 1966.

IN GULF OF MEXICO

Soviet and Cuban: U. S. shrimp vessels returning from fishing grounds in the southern Gulf of Mexico reported concentrations of Soviet stern trawlers and Cuban trawlers somewhat inside 12 miles off Cabo (North-easternmost point of Yucatan Peninsula, Mexico). They seemed to be after finfish not shrimp.

No foreign vessels were reported fishing off or near the U. S. Gulf Coast.

OFF CALIFORNIA

Soviet: Fishing off California in February was about the same as in January 1967: 1-4 fishing and support vessels were sighted each week about 14 miles off coast. No Soviet vessel was fishing within 9-mile contiguous fishery zone. On February 22, however, the U. S. Coast Guard permitted a 3,000-gross-ton refrigerated fish carrier "Dekastri," built in Sweden, to come within 4 miles off Point Reyes (in Drake's Bay, about 25 miles northwest of San Francisco) to accept the catches of two Soviet large stern trawlers (BMRTs "Kuba" and "Boris Gorinskii"). A Soviet tanker, the "Sinogorsk" was also allowed to enter the 9-mile fishery zone to refuel the fishing vessels. A Coast Guard cutter supervised the 2-day operation.

The small number of Soviet vessels indicates that for the time being the USSR is still conducting exploratory fishing. Most basic fishery research apparently has ended. The commercial vessels now are sampling to determine commercial potential.

During the weekly patrols, no Soviet vessel was observed fishing and no catch was seen aboard. As a result, there is no information as to species actually caught.

The fact they unloaded catches on a refrigerated fish carrier indicates good catches. From the knowledge of fishery resources present in areas of Soviet fishing, the California State Fish and Game Commission concluded that most catches are probably species of Pacific rockfish.

OFF PACIFIC NORTHWEST (Washington and Oregon)

Soviet: The vessels increased steadily during February--from 1 at the beginning to about 10 fishing, support, and research vessel by month's end.

Most fishing was off Oregon, although 1 research vessel was sighted exploring off Washington's coast.

Fishing off Oregon has been off Newport area. All vessels operated seaward off the 9-mile contiguous fishery zone. The catch primarily was Pacific hake. The best catch observed was on February 14, when one SRT landed 30,000-40,000 pounds of hake in one drag.

The greatest number (12) of fishing and support vessels was sighted during the surveillance flight in the fourth week, ending Feb. 23: 3 large stern trawlers, 6 medium side trawlers, and 3 support vessels (refrigerated fish carriers and tankers).

Two of the 6 medium trawlers were fishery research and exploratory vessels: one, the "Ogon," traditionally has conducted fisheries research in the northeastern Pacific for the Soviet Pacific Scientific Research Institute for Fisheries and Oceanography (TINRO); the other, the "SRTM-8437," is an exploratory research vessel of the Sakhalin Fisheries Administration.

The pattern of Soviet fishing shows an intensive exploratory activity. As in 1966, this should culminate soon in increased fishing off the Pacific Northwest.

Japanese: Two stern trawlers were exploring off Washington and Oregon coasts in February. Both ocean perch and hake were seen on the vessels.

OFF ALASKA

Soviet: About 130 vessels were fishing during February.

The Soviet Pacific perch fishery in the eastern Gulf of Alaska was continued by about 30 fishing and support vessels. One trawler was active on the Portlock Bank in the central Gulf; in the western Gulf, the fishery was continued by about 6 trawlers and one support ship.

Shrimp fishing on the Continental Shelf surrounding the Shumagin Islands was continued by at least 20 trawlers and 1 canning factory ship. The shrimp catch during the first 20 days of February was nearly 4.9 million pounds, more than shrimp quota for the entire month.

Herring fishery in the eastern Bering Sea failed to develop this year. A few vessels (5 trawlers and 4 support ships) were fishing in mid-January. But, like 1966 and 1965, they failed to locate significant herring concentrations. This accounts for the many vessels (70) fishing for eastern Bering Sea flatfish. Because of the scarcity of herring stocks, the quota was not met.

The eastern Bering Sea flounder fishery was continued by about 50 trawlers and 20 support ships.

Japanese: About 31 vessels were fishing in Alaska during the month.

The Pacific ocean perch fishery on Albatross Bank was continued by the factory trawlers "Daishin Maru No. 12," "Yutaka Maru," and "Ryuyo Maru," supported by the reefers "Reiyo Maru" and "Haruna Maru."

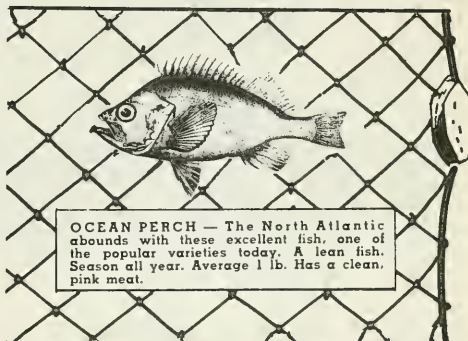
The Alaska pollock fishery north of Fox Islands was conducted by the factoryship "Chichibu Maru" (replaced by "Meisei Maru No. 2" about mid-month) and accompanying trawlers "Aso Maru," "Zuiyo Maru No. 2," "Akebono Maru No. 52," "Tenyo Maru No. 3," and "Inase Maru No. 5."

One longliner, the "Fukuyoshi Maru No. 35," fished for sablefish north of central Aleutians.

At the end of February, 2 king crab factoryships, the "Tainichi Maru" and "Keiki Maru," were reported en route to the king crab grounds in eastern Bering Sea.



NOTE: The first U. S. Fisheries Exposition at Suffolk Downs, Boston, Mass., will be held October 10-14, 1967--instead of October 7-14 as first announced by its organizers.



STATES

Alabama

1966 CATCH WAS UP

Alabama had total landings of 20,300,000 pounds of fisheries products in 1966 worth \$6,600,000. The 1965 figure was 17.8 million pounds worth \$5 million dockside.

Shrimp led with 10,600,000 pounds worth \$4,915,000, followed by food fish, 6,200,000 pounds worth \$888,000; crabs, 2,200,000 pounds worth \$80,000; and oysters, 1,300,000 pounds valued at \$617,000.



Alaska

KODIAK KING CRAB CATCH DECLINES

The catch of king crab per unit of effort in the Kodiak Island area has been declining since late 1966. Weather explains part of this. Some fishermen are considering a switch from king crab to Dungeness crab fishing.

There is some basis for the belief that the sustainable yield of some stocks could have been reached or passed during 1966. A computer program is being developed to analyze all tagging and recovery data collected since May 1961. The data may serve to define the geographical ranges of various stocks of king crab being taken in the Kodiak Island area.



California

RESOURCES AGENCY ISSUES REPORT

The trawl fleet made "exceptional catches of English sole" in the vicinity of the Klamath River and Pt. Reyes, states the recent report of the Resources Agency of California. A Eureka otter trawler caught a record 132,000 pounds of predominantly English sole in 3 fishing days. The captain and 3-man crew received \$10,552.82.

Rockfish landings were light at Eureka, and landings of bocaccio and chilipepper in

the Fort Bragg area were moderate. Landings at Monterey were below par, but catches off Morro Bay and Santa Barbara were moderate.

Monterey draggers complained of competition from 2 Soviet stern-ramp trawlers operating between Ano Nuevo and Davenport on productive grounds fished frequently by local vessels. One captain reported that while fishing 12 miles off Davenport, on February 16-17, he was sandwiched between 2 Soviet vessels. He reported both vessels with large hauls of rockfish taken with mesh smaller than the U. S. 4½-inch minimum size.

About 10 boats were fishing for crab in the San Francisco area--concentrated at Russian River, Bodega Bay, Pt. Reyes area, and in deeper water between Farallones and Pt. Reyes.

About 5½ million pounds of crab had been landed at Eureka, Trinidad, and Crescent City by mid-February. Total landings for the Fort Bragg-Crescent City area were expected to top 6 million pounds by month's end.

No Sardines for Terminal Island Canneries

The 1966/67 cannery season closed March 1, 1967--the poorest on record and the first in which no sardines were delivered to Terminal Island canneries. Statewide landings during the cannery season were estimated to be under 175 tons. Nearly all of the fish were sold for bait because of the higher price of \$200-400 per ton. Catches during the past season were almost all large, old fish and primarily fish mixed with mackerel or very small schools of ¼ to 3 tons. The Resources Agency believes "all available evidence indicates our sardine population is at a seriously low level with the prospect of significantly improved catches in the near future extremely dim."

February had good weather and jack mackerel landings increased nearly 200 percent over January landings. Total mackerel landings for January-February were above those of the same period in 1965 and 1966.

Pacific mackerel landings remained low (about 60 tons) and most fish were landed at fresh fish markets.



Hawaii

BOOK INDICATES NEW TUNA RESOURCES

A very large potential fishery resource exists in the central Pacific Ocean, states a new, 266-page book published by the State of Hawaii. The book, "Proceedings of the Governor's Conference on Central Pacific Fishery Resources," is based on a Hawaiian conference of last year. A dozen scientists reviewed the knowledge of Pacific tuna fisheries and estimated their potential increase. Sponsored by Hawaii and BCF, the conference was chaired by John C. Marr, BCF Area Director, Hawaii, and Michio Takata, Director, Hawaii Division of Fish and Game.

A large stock of unfished skipjack tuna in the central Pacific holds the most promise; it is untouched, except by the small Hawaiian fleet. (Skipjack are widely caught by the Japanese in the western Pacific and by California-based vessels off Mexico and Central America.)

A theory advanced by Brian J. Rothschild, BCF Biological Laboratory, Honolulu, suggests that the spawning grounds of the eastern Pacific skipjack lie somewhere in the equatorial central Pacific. They move to American shores early in their lives and support an annual catch of about 70,000 tons. After less than a year there, they return to the central Pacific to spawn.

Skipjack and Yellowfin Catches Can Be Increased

Rothschild and Ralph P. Silliman, BCF Biological Laboratory, Seattle, estimated that at least 150,000 tons of the valuable skipjack might be taken annually. This would almost double the entire present U. S. tuna take.

The conference group on yellowfin tuna agreed that if methods could be devised to harvest yellowfin tunas smaller than those now taken by the Japanese longline fleet, the U. S. catch of this valuable species could be increased by about 50,000 tons a year, worth about \$12.5 million to U. S. fishermen. The group was chaired by Garth I. Murphy, Department of Oceanography, University of Hawaii, and Jerome Pella, Inter-American Tropical Tuna Commission, La Jolla, Calif.

The prospects for increasing the bigeye tuna catch, now taken by the Japanese longliners in the central Pacific, are less prom-

ising. Ralph P. Silliman and Vernon E. Brock, Dept. of Oceanography, University of Hawaii, estimated that the catch could not be increased materially.

The key to the problem of greatly expanding the fisheries is the development of new techniques and gear to harvest the new stocks economically. Dayton L. Alverson, Base Director, BCF Exploratory Fish and Gear Research Base, Seattle, and Albert L. Tester, Department of Zoology, University of Hawaii, agreed that the present Hawaiian industry could be stimulated by new approaches to bait handling and gear. Tapping the new resources requires study of tuna behavior--particularly the kind conducted by BCF's Honolulu Laboratory with sonar equipment aboard its research vessel "Townsend Cromwell."

The new book also contains background papers reviewing research results on tunas throughout the Pacific.



Mississippi

1966 LANDINGS DECLINED

Mississippi's landings in 1966 were 255,021,000 pounds worth \$8,594,000. In 1965, the total was 371.2 million pounds valued at \$9.6 million.

Industrial fish, including menhaden, composed the bulk of landings. They totaled 240 million pounds worth \$4,340,000. Other landings were: food fish, 4,100,000 pounds worth \$930,000; shrimp, 7,335,000 pounds at \$340,000; crabs, 1,374,000 pounds valued at \$97,000; and oysters 2,220,000 pounds at \$586,000.



North Carolina

CALICO SCALLOP INDUSTRY IS ACTIVE

The North Carolina scallop industry reported in mid-March that it was producing calico scallops at the rate of 10 million pounds a year. On March 13, twelve vessels produced 98,000 pounds of calico meat. This fishery developed with BCF technical assistance and the cooperation of State and local interests.



Oregon

WINTER SALMON CATCH WAS GOOD

The best chinook landings since 1953 and the largest steelhead take since 1961 marked the recently completed winter commercial fishing season on the Columbia River, reports Herman P. Meierjurgan, Oregon Fish Commission chairman. The season opened on February 15 and ran through March 1. Preliminary estimates show that 7,280 spring chinook weighing 148,900 pounds and 9,900 steelhead weighing 97,200 pounds were taken. The figures include total fish landed at both Oregon and Washington points. The average catch for the winter season from 1959 through 1966, when it was shortened to its present two weeks, was 4,700 chinook and 7,500 steelhead.

Landings during the winter season are of little value in predicting the spring chinook run, Meierjurgan said. Unpredictable weather and variation in the timing of the spring chinook run, especially of this early part of the run, prevent any useful comparison of landing figures with other years. Last year, for example, much bad weather kept fishermen off the Columbia during part of the season; more favorable weather during the recent season permitted more fishing.

Spring Season To Be Set Soon

There is less fishing intensity in winter than later in the year, Meierjurgan said. Winter season activity is centered on the lower river with little effort given to drifts above St. Helens.

A decision on the spring commercial season on the Columbia River will be determined in the latter part of April. Then, the Fish Commission and the Washington Department of Fisheries will hold a joint public hearing, and set the spring season--based on the latest available biological data.

* * *

COHO RELEASED

Some 10 million yearling coho were slated to be liberated into Oregon waters last month. Since 1958, an average 7.6 million of such young salmon (smelts) have been liberated from Oregon Fish Commission hatcheries. Of the 10 stations rearing coho, 4 are on the coast and 6 on the Columbia River.

Ernest R. Jeffries, the Commission's fish culture director, said that the Commission cannot claim all credit for excellent coho fishing, both sport and commercial, during the past few years, but it is convinced that the coho releases have given the runs a substantial boost. Good ocean survival conditions are an extremely important factor in maintaining good salmon runs, Jeffries noted.

The fish have spent their first year in fresh water and are ready to migrate to the ocean. They will remain there until the spawning urge sends them back into the rivers on the spawning run. Some smelts will return in fall 1967 as jacks, 2-year olds, but most will not return until fall 1968 as fully mature 3-year olds.

Hatchery Production Being Evaluated

This year is the first of a 2-year program to evaluate the contribution of hatchery production to the sport and commercial fisheries. Ten percent of the 10 million coho are marked with an identifying fin-clip. The same percentage of coho production in Washington hatcheries and U. S. Fish and Wildlife Service hatcheries also are marked in a Federal-state financed program to determine where and how many of their fish are harvested.



Washington

HAKE FISHERY IN PUGET SOUND SHOWS PROMISE

Five vessels were fishing in mid-March for Pacific hake in the Port Susan area of Puget Sound, Washington. All 5 were using midwater trawls and telemetry systems designed and developed by BCF's Exploratory Fishing Base in Seattle. The vessels were delivering their catches to pet food and fish meal processors in LaConner, Bellingham, and Everett, Washington.

This seasonal hake fishery started in late November 1966 and is expected to continue until May 1967. By mid-March, over 6 million pounds had been landed. The season's total is expected to reach 12-14 million pounds. In 1966, this area's production was 6¼ million pounds.



BUREAU OF COMMERCIAL FISHERIES PROGRAMS

THE SUBMARINE "PISCES" AS A FISHERIES TOOL

By William L. High*

BCF's Exploratory Fishing and Gear Research Base, Seattle, Wash., chartered the two-man submarine *Pisces* for 6 days in October 1966 to determine its usefulness in fisheries research. Twenty-nine dives were made to depths between 90 and 552 feet in Puget Sound, Wash. Although the ascent and descent rates were variable, an average ascent from 300 feet took 6 minutes. We observed gear performance, fish behavior, plankton distribution, and currents and found the submarine well suited for numerous research objectives.

On the negative side, visibility often was limited, the sub was unable to effectively follow a midwater trawl--and one of the most frustrating aspects of observing from a submarine was the inability to capture, identify positively, and examine the animals sighted. Scientists must soon develop suitable sampling devices, especially for those submarines with external manipulators.

The *Pisces*, completed in 1966, is the first of several to be constructed by the Canadian firm, International Hydrodynamics, Ltd. BCF's aims in chartering it included: (1) Provide orientation dives by Bureau personnel to evaluate the suitability of small submarines for fishery investigations, (2) observe the behavior of Pacific hake (*Merluccius productus*) under natural conditions and the influence of lights and capturing gear, and (3) determine whether the submarine could be operated near pelagic trawls.

PROCEDURES

Submarine activities were confined to Saratoga Passage, a weather-protected area within Puget Sound, Wash., where large concentrations of hake occur. Each morning, the *Pisces* was lowered into the water from a large barge equipped with support facilities and towed to the nearby dive location with a 30-foot power launch (fig. 1). The pilot and the first observer of the day boarded before launching and used the tow period for pre-dive system checkout and observer orientation. On later dives, observers were transferred while the *Pisces* floated on the surface.

*Assistant Chief, Gear Research Unit, BCF, Exploratory Fishing and Gear Research Base, Seattle, Wash.

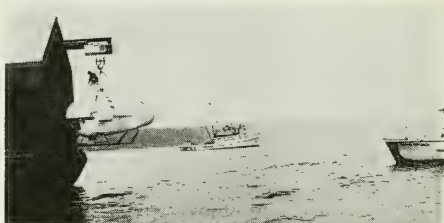


Fig. 1 - The *Pisces* being lowered into the water from the support barge and towed by the "Hudson Explorer" (right) to the nearby diving location. The Bureau's vessel "John N. Cobb" (center) provided additional support services.

DESCENT: The submergence procedure required about 10 minutes because buoyancy is altered by transferring oil from bladders to spheres. The sink rate is controlled by manipulating oil level within the spheres; however, the rate usually was about 30 feet per minute to permit observations of plankton layers and midwater fish species. The *Pisces* could readily suspend in midwater.

SUBMERGED OPERATIONS: Once the vessel was on the bottom, the equipment was

checked out, and oil was shifted by electric pump to provide neutral buoyancy. Fore and aft tilt of the submarine was achieved by actuating a hydraulic ram that moved the battery case along a short track.

Voice communication was maintained at all times with the launch, which homed on the voice signal using a directional transducer.

The life-support system functioned very well. The submarine interior was always dry. No headaches or other physical discomforts were experienced.

Every 45 minutes, the atmosphere was analyzed for CO₂ content and relative humidity. At no time did the CO₂ level exceed 0.9 percent. A small blower was actuated intermittently to force the air through CO₂ and moisture scrubbers. After the blower ran 5 minutes, CO₂ was reduced to less than 0.4 percent and relative humidity from 90 to 55 percent. Oxygen was introduced by a hand-operated valve. Although water temperature was 52° F., internal air temperature never dropped below 58° F. The sphere contains a heating system, but it was not needed during the dives.

ASCENT: At the end of each dive, oil was again transferred from the spheres to bladders to increase buoyancy. This method provided a slow, constant rate of ascent. A more rapid ascent could be made by also introducing compressed air into a doughnut-shaped ballast tank beneath the fiberglass cowling. Air was fed in until positive buoyancy was reached and the submarine lifted off bottom. The ascent rate increased from 0.3 to 2.0 feet per second as the air expanded to fill the collar during the ascent. Total ascent time from 300 feet averaged about 6 minutes.

With the protective sail around the hatch opening, it was convenient to transfer personnel without lifting the submarine from the water. Observers were easily transferred to the submarine in a 1-foot chop. Observers could be exchanged, the Cardoxide CO₂ scrubber replaced, and the submarine underway again in less than 10 minutes.

The *Pisces* was towed back to its barge at the end of each day. Batteries were recharged overnight and other routine maintenance undertaken.

RESULTS

Twenty-nine dives were completed during the 6-day charter. Had a second pilot been available, the number of dives--or the average time per dive--could have been increased. The hours of operation depend on the amount of power used to propel the submerged submarine. The average dive was to 256 feet and for 56 minutes. However, one 2-hour dive reached 552 feet.

Weather was generally good and did not hamper activities. Low water visibility did restrict several aims. In near-surface layers, objects could be distinguished at 15 to 20 feet, but in deeper waters and near the bottom, visibility at times was reduced to 3 feet.

Several factors contributed to the *Pisces*' inability to effectively follow a midwater trawl towed by BCF's research vessel John N. Cobb. The magnetic compass reacted too slowly to be effective. Turns were made by varying the speeds of the two side-mounted motors. It was difficult to control a turn because of the submarine's momentum once a turn began. Heavy discharge rates on the batteries during high power maneuvers greatly restricted the running time. Available power was used up in a short time.

Twenty-two persons made dives in the *Pisces*. Although the primary aim of most was to familiarize themselves with the submarine and its potential use, some noteworthy observations were made: Hake, spiny dogfish (*Squalus acanthias*), ratfish (*Hydrolagus coliei*), flounders (several species), and shrimp (several species) were noted on most dives. Walleye pollock (*Theragra chalcogrammus*), shiner perch (*Cymatogaster aggregata*), Pacific tomcod (*Microgadus proximus*), rockfishes (*Sebastes* spp.), and crabs (*Cancer magister*) were seen less often.

Hake Not Affected By Sub Or Lights

Three dives were made near a midwater trawler that was catching up to 20,000 pounds of hake per 90-minute tow. During the first two dives, a few hake were observed near the bottom. After the sub reached bottom, all motors and lights were turned off for several minutes, then the lights were again turned on.

Apparently, hake were not affected either by the submarine or its powerful lights. On the third dive, the trawler made an echo sounding trackline directly over the submarine. The resulting echogram, as evaluated by the captain, indicated fish to be abundant from the bottom up to a distance of several fathoms, but the observer saw no hake. The pilot and observer saw numerous dogfish 25 to 30 fathoms below the surface. Near bottom, the observer saw a heavy concentration of various large plankton and a few cods, probably Pacific tomcod or walleye pollock.

During many dives, juvenile hake were found between 28 and 60 fathoms. Although they did not appear to be schooled, several often were seen at one time. These fish were about 2 to 5 inches long. The bodies appeared pink, but this may have resulted from the submarine's lights.

These hake were drifting with the tide in either a head-up or head-down attitude. Every few seconds they would assume a horizontal position and swim erratically for a short distance, stop, and return to the heads-up or down position. Those drifting close to the bottom sometimes would begin their swim and hit the bottom. These hake may have been feeding for they were seen snapping at unidentified objects.

View From The Sub

Definite phototaxis (movement of organisms toward light) was shown only by one fish species, shiner perch, on one dive to 96 feet. A large school accumulated when the Pisces settled on the bottom with its lights turned on. The school dispersed after the lights were turned off for about 3 minutes, then regrouped when the lights were turned on again. As the Pisces began ascent, the shiner perch followed to about 30 feet off the bottom.

Plankton and debris were abundant at all depths. Whenever the Pisces was stationary, plankton quickly gathered around the lights. Few distinct plankton layers were noted, but certain forms were definitely absent from some levels. During the night dive to 552 feet, larger species appeared after the sub descended beyond 100 feet. A thicker layer of plankton and silt extended from 480 feet to the bottom.

Numerous holes were seen in the mud bottom. The smaller ones, up to about 3 inches in diameter, seemed created by marine forms other than clams; however, no animals were detected. At 552 feet, several holes about 6 inches in diameter and at least 5 inches deep were seen. No detectable activity or water currents originated from the hold, although the Pisces remained quiet for 30 minutes and lights were extinguished several times for periods up to 10 minutes. Silt and other debris carried across the bottom by strong currents probably would fill the holes within a few tidal cycles, if some animal did not clean them.

Phosphorescent activity varied between dives. Usually, it was most apparent when the darkened submarine lay on the bottom with a strong tide running. Distorted current patterns caused by the sub's presence were illuminated by the phosphorescent marine forms.

Tidal currents at 200 or more feet often were quite different from surface currents. On one occasion, an estimated $1\frac{1}{2}$ -knot current flowed on the bottom while the surface was at slack water. Direction of flow sometimes was 180° from that on the surface. As the bottom current increased, silt was picked up and created a muddy layer up to 30 feet off bottom.

Modifications Could Improve Pisces' Performance

Some aspects of fishery research from Pisces-like submarines are feasible. Biological surveys can be successful, especially on rough bottom areas not suitable for conventional sampling gear. Plankton types, and their distribution within a water column, can be studied. By operating at reduced power, stays of 24 hours or more would be practical.

The Pisces now is equipped with a 1,500-pound skid. By altering or removing the skid, large instrumentation packages could be accommodated, or a third man could easily be carried within the sphere, although his vision through the viewing ports would be limited.

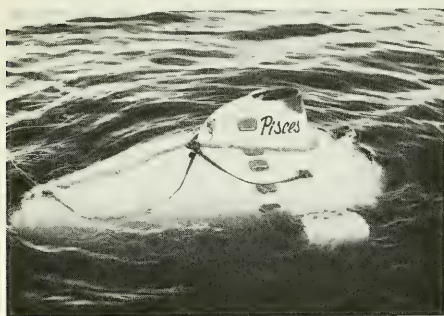
The system of buoyancy control used in the Pisces has several distinct advantages: (1) Costly weight need not be dropped after each dive, or installed before each descent;

and (2) the submarine can stop at any mid-water depth, then readily rise or descend any number of times during a dive.

Additional attempts to follow trawls may be worthwhile if a gyrocompass, more precise steering, and increased speed and power are provided. Nonmobile fishing gear, such as crab pots or longlines, probably can be viewed effectively.

Equipment scheduled for future installation includes: A direct reading current meter, a depth telemetry system, gyrocompass, and an improved submarine tracking system that will operate independently of the voice communication system.

THE PISCES



The Pisces is a two-man submarine designed to operate at depths up to 4,800 feet. The pressure sphere has an inside diameter of 76 inches, permitting ample space for pilot, observer, and more instruments. Two viewing ports situated forward give each man 130° vision ahead of the submarine. A smaller port permits a camera to be mounted permanently between the viewing ports.

The Pisces is relatively portable. Overall, it is 16 feet long, 11 feet wide and has a gross weight of about 14,000 pounds. Payload capability is about 1,500 pounds.

Present instrumentation includes echo sounder with forward and bottom transducers, magnetic compass, two external pressure gauges, submersible-to-surface voice communication, two 1,000 watt external quartz-iodide lights, internal-external thermometers, 16-mm. cine camera, and a tape recorder. For the 6 days it was chartered, a

Government-owned depth telemetry system was installed.

The life support system includes Cardroxide¹/ CO₂ scrubbers, supplemental oxygen storage tank, CO₂ analyzer, humidity meter and dryer, and emergency rebreathers. Environmental endurance is calculated at 290 man-hours.

¹/Trade names mentioned do not imply endorsement of commercial products.



BCF Reactivates Vessel Mortgage Insurance Program

For the first time since November 1966, when the program was forced to mark time for lack of funds, BCF is taking applications for fishing vessel mortgage and loan insurance. A notice in the "Federal Register," March 7, 1967, made public that the authorization for outstanding mortgage insurance on fishing vessels had been increased to \$20 million.

The program provides for the insurance of mortgages and loans to construct, reconstruct, and rebuild vessels. The mortgage's face amount cannot be more than 75 percent of the work cost. Maturity cannot exceed 15 years, nor can the interest rate be over 6 percent.

Since the program began in 1960, \$10 million have been made available to strengthen the fishing fleet.

More information may be obtained from BCF regional offices.



Interior Awards 18 Oceanography Study Grants

The Department of the Interior has awarded to 18 universities graduate educational grants totaling about \$200,000. The 2-year grants, part of the National Oceanographic Program, will be available for the 1967 fall term. The universities select deserving students who are graduates or about to be graduated.

The program was started in 1962 to help develop scientists in fishery oceanographic subjects. Administered by BCF, the program makes \$200,000 available each year. Scientists assist Interior Department in selecting universities for the grants.

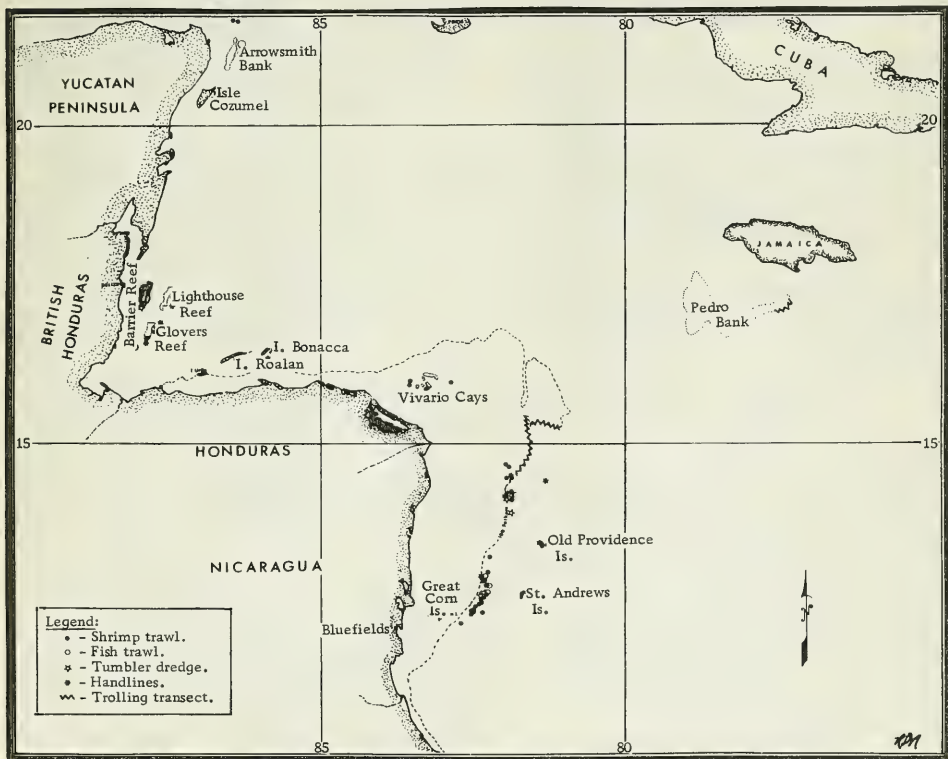
Grants were made to 12 schools in 1962, 17 in 1963 and 1964, 18 in 1965, and to 19 in 1966. Applications for the 1967 awards came from 49 institutions in 33 States.

Students apply for grants to the schools they wish to attend. The grants provide for payment of tuition and fees and living expenses of \$3,000 a year. Married students with children also receive a family allowance of \$1,000.

"Oregon" Finds Commercial Amounts of Pelagic Fish

The results of the Oregon's 39-day cruise in the western Caribbean indicate significant commercial concentrations of pelagic fishes available to conventional gear (Cruise No. 115, ended Feb. 24).

Cruise objectives were: (1) to continue seasonal exploratory fishing coverage in the western Caribbean with emphasis on trawling, trolling, handlining, and dredging off the coasts of British Honduras and Nicaragua; and (2) to cooperate with the United Nations Special Fund Caribbean Fisheries Project by providing at-sea training for observers from British Honduras, Bonacca Island, and Jamaica.



R/V Oregon pelagic fish exploratory Cruise 115.

Trawling near Vivario Cays, off Honduras and outside currently used fishing grounds, produced light catches of grooved shrimp. Nighttime catches of 6 to 13 pounds (heads-on) of pink shrimp were made per 90-minute drag with a 60-foot shrimp trawl.

Red Snapper Fishing Encouraging

Fishing for red snapper was conducted with handlines and reels off British Honduras, Honduras, and Nicaragua with encouraging results. Several species of snapper and grouper were found distributed throughout the area. The 3 most abundant were yelloweye snapper, blackfin snapper and red snapper. These species were caught on handlines. Other snapper species captured on handlines were dog snapper (Lutjanus jocu), lane snapper (Lutjanus synagris), grey snapper (Lutjanus griseus), black snapper (Apsilus dentatus), vermilion snapper (Rhomboplites aurorubens), and yellowtail snapper (Ocyurus chrysurus).

Trawling was conducted at 30 localities along the Nicaraguan slope where suitable bottom conditions were located out to depths of 158 fathoms. In this area, small amounts of yelloweye snapper were caught in the 60 to 110-fathom depth range, where catches ranged from 0 to 62 pounds per 60-minute drag with a 60-foot trawl. The best catches were made in 100 to 110 fathoms, where bottom temperatures averaged 18° C.

Eleven dredge stations were occupied to help assess Caribbean fauna--and to provide specimen material for other studies in technology and biology.



"Delaware" Continues Continental Shelf Slope Explorations

The M/V Delaware did not find commercially significant concentrations of fish or shellfish in its explorations of the area between Hudson Canyon and Cape Hatteras, N. C. (Cruise 67-1, Feb. 2-21, 1967.) The largest concentrations were dogfish (Squalus acanthias)--so numerous that one net was lost due to their number and weight taken on a 30-minute tow. On other sets, dogfish seemed generally numerous wherever other fish were encountered in any quantities. It seems probable that fish productivity of these waters might be increased if this species were removed.

Cruise 67-1 completed coverage of this area begun on Cruise 66-11 (Nov. 29-Dec. 15, 1966). The purpose of 67-1 was to determine the occurrence and abundance of fish and shellfish species available to trawl gear. Most of the survey stations originally scheduled for winter sampling have been fished. The same stations will be fished again during a future summer period (and possibly spring and fall as well) to show the changes that occur in fish abundance and seasonal availability.

Procedure: The stations sampled were arranged in transect lines extending across the slope of the bottom from near shore to deep water over the Continental Slope. The sampling stations were 10, 20, 35, 50, 75, 100, 200, and 400 fathoms along each line. Twelve transect lines were plotted between Hudson Canyon and the offing of Cape Hatteras. These lines divide the area into subdivisions, which loosely correspond in size.

Results: 59 sets were made--54 were successful tows. With the exception of the 100- to 400-fathom stations east of False Cape, Va. (not fished because restricted for submarine operations) all originally scheduled sampling stations of 10 to 400 fathoms were fished. However, the excessive loss of flotation gear on the net prevented fishing most of the 600- and 800-fathom stations. Future sampling of deep-water stations will be attempted on later cruises using improved flotation gear.

Although the catches were generally small, a fairly large number of species was taken.

For further information contact Dr. John R. Thompson, Acting Base Director, or Ernest D. McRae, Jr., Exploratory Fishing & Gear Research Base, State Fish Pier, Gloucester, Mass., 01930, Telephone: 617-283-6554.



BCF Scientists Find Rare Tuna Near Hawaii

A fish whose natural habitat is the shores of the Americas has been found about 3,000 miles from home--in the waters off the island of Hawaii. It is a female black skipjack (Euthynnus lineatus Kishinouye) about 17 inches long. The species has been reported before only from the coastal waters of Mexico, Central America, northern South America, and the Galápagos Islands.

The fish was taken by BCF's research vessel "Charles H. Gilbert" about 35 miles west

of Hawaii in a mixed school of skipjack tuna and small bigeye tuna. The discovery was made by Walter M. Matsumoto, Biologist, and Tagay Kang, Biological Technician, of BCF's Biological Laboratory, Honolulu.

Matsumoto and Kang offer 3 possible reasons for the rare catch: (1) The black skipjack is found more widely in the oceans than had been known. (2) This fish might simply be a stray from the eastern Pacific Ocean. (3) It may be that the species is beginning to spread from its known habitat.



She Casts Her Net Across The Tropical Pacific

From a quiet office adjoining the University of Hawaii campus in Honolulu, Mrs. Mary Lynne Godfrey supervises a data-gathering network that covers millions of square miles of the entire tropical and subtropical Pacific Ocean.

Mrs. Godfrey is Chief of Scientific Services, BCF Biological Laboratory, Honolulu. A staff member since 1950, she supervises young, college-trained technicians who collect and process the basic data the laboratory uses in its studies of the fisheries and oceanography of the Pacific. Mrs. Godfrey originated some of the widely used methods of recording biological data for machine processing.

Most of the laboratory's technicians work at the Dole Street Laboratory unless required to make voyages on the two research vessels: "Charles H. Gilbert" and "Townsend Cromwell." They take turns at manning the laboratory's two field stations—one in American Samoa, the other in the Palau Islands, Trust Territory of the Pacific.

They Start Early

At 5 o'clock in the morning, every day except Sunday, a BCF technician joins the fish handlers and buyers at Honolulu's two fish auctions. He measures and observes the daily catches of boats from the Oahu-based, 22-boat, longline fleet. The fishery technician rapidly records weights, lengths, and sex of the tunas and marlins. He may also draw samples of tuna blood or collect gonads or stomach contents.

At five in the evening, 5 days a week, two technicians wait at the tuna cannery at Kewalo Basin as the pole-and-line caught skipjack are unloaded and trundled in for processing. They, too, select randomly and make length, weight, and sex measurements and collect blood samples.

Early or late, whenever and wherever pelagic (ocean) fish are unloaded in any quantity, BCF has tried to be there to collect data that will further its studies. Work starts at 6 a.m. for the man stationed in American Samoa, where Japanese, Korean, and Chinese fishing boats unload their catches at two busy canneries in Pago Pago.

In April 1965, in cooperation with the Trust Territory of the Pacific Islands and the newly established fish freezing plant in Koror, Palau Islands, the laboratory started similar sampling of fish taken in that area of the Western Caroline Islands.

The study of Pacific tuna is further advanced by a knowledge of its environment. Agencies with stations all over the Pacific are assisting in the collection of surface water temperatures and salinity samples for the Bureau. This collection leads to a more complete understanding of the movements of ocean currents and water masses and, ultimately, of the fish in them.

When Program Started

The project began in late 1953. Working with the District Commissioner of the Line Islands District, Gilbert and Ellice Islands Colony, BCF scientists arranged for Gilbertese employees on Christmas Island to gather the desired temperatures and water samples. Mrs. Godfrey says this important set of records has continued almost unbroken to the present time.

In November 1955, at Koko Head on Oahu, BCF Honolulu Laboratory employees began a twice-weekly collection of water samples for chemical analysis. Like the water at all sampling sites, Koko Head water is characterized by open-ocean conditions.

In early 1957, a weekly sampling program was begun on Wake Island, French Frigate Shoals, and Midway Island. Johnston Island was followed by Manele Point on Lanai, American Samoa in 1961, and Guam in 1962. From each island, the Bureau is obtaining useful sets of data through the helpful and longstanding cooperation of the Weather Bureau, Coast Guard, Navy, Departments of Agriculture of both Guam and the Government of American

Samoa, and the Hawaii Division of Fish and Game.

In addition to data from sampling sites on land, BCF uses material from two ocean weather stations. The Weather Bureau and the Coast Guard have made possible the collection of daily surface water temperatures and weekly water samples from Weather Stations Victor (34°00' N., 164°00' E.) and November (30°00' N., 140°00' W.).

Under Mrs. Godfrey's supervision, millions of items of data collected from this wide area are standardized and punched on cards for machine analysis by specially trained operators.



Their Road Show Abroad Stars Fish

When they appeared in London the first time, on January 18, 1966, one British agent representing one U. S. firm was on hand. When they returned February 14, 1967, that agent was working for 4 U. S. firms--and there were 4 other agents, each representing a U. S. firm, and still others seeking to take on U. S. fishery products.

Between the 2 dates, the members of BCF's Office of International Trade Promotion (OITP), Sam Hutchinson, A. L. "Gus" Morel, and L. F. "Nip" Reynolds, had staged their shows in Italy, Austria, Germany, and France.

OITP travels abroad to expand the markets for existing U. S. fishery products--and to promote new products. Their showcases consist of high-quality frozen and canned fishery products conveniently packaged. Included are such species as Alaska king crab, whitefish caviar, shrimp, lobsters, lisa, salmon, pasteurized crabmeat, and squid.

So far, the program has concentrated on Western Europe because that area is enjoying a rising standard of living. European visitors to the fairs have warmed to the processed, packaged, and convenient fishery products. These products have shown that they can compete for the housewife's attention and money. For many housewives, serving a lobster dinner, shrimp as hors d'oeuvre, or some other gourmet items reflects the new prosperity.

U. S. exhibitors have learned that there is a burgeoning market for American fishery products.



Fig. 1 - "Incredible!" The expression on the face of this leading French importer says: "Incredible". He was looking at the display of fresh fish, a subordinate part of the exhibit, at Pompano, Spanish mackerel, mullet, swordfish, ocean trout, and scallops. He added: "Unique! How can they be so fresh?"

The cool man on the far left is Sam Hutchinson, Head of the Office of International Trade Promotion.

Program Aids Small U. S. Firms

OITP works with the U. S. Department of Agriculture to participate in the fairs. USDA handles the background work--survey of area, time of fair, location--and invites between 2,000-3,000 top tradesmen in the host and neighboring countries. These include importers, brokers, distributors, agents, and institutional operators.

The International Food Trade Fairs have provided U. S. firms their largest audiences at the least expense. The U. S. processor has only to send his product and pay the freight and duty on the samples he ships. The OITP provides a display booth, audience of top trade people, advertising, and personnel to coordinate the promotional efforts. The OITP specialist assists the foreign importer in preparing inquiries and passes them on to U. S. firms able to quote prices and supply the items.

If the small U. S. firm worked alone, the cost of just renting space and paying the dec-



Fig. 2 - U. S. frozen fishery products at U. S. Trade Center Exhibition, London, England. Tempting American fish products were shown in 6 of these deep freeze units and upright cases. Sampled by the visitors were such tasty products as king crab, scallops, shrimp, lobsters, fish wieners, chub fillets, stuffed flounder, smelt, seafood baskets, crab sticks, and shrimp burgers.



Fig. 3 - U. S. frozen fishery products at the U. S. Trade Center Exhibition, February 14-23, 1967, London. English importers saw, tasted, and ordered American fishery products that were attractively displayed, high in quality, and competitive in price. Shown here in BCF's display cabinets are Alaska king crab, breaded fantail shrimp, dungeness crab, shrimp (individually quick frozen), and Maine lobsters.

orator, electrician, and staff would amount to \$1,500 to \$2,500. By working through OITP, his bill is about one tenth this figure. It is a real good deal to promote his company's product abroad.

The Box Score

To date, 10 fairs have produced nearly one million dollars in sales for U. S. firms. The OITP staff projects a figure twice this amount as a result of these efforts. Some firms have sold the bulk of their seasonal inventory; in two instances, the demand was so large that it could not be met. After a sale of 150 tons of shrimp in London, orders for an additional 50 tons of shrimp and 5 tons of king crab had to await later delivery.

The fairs also are an ideal meeting place for U. S. firms seeking trained foreign agents, and vice versa. They give the U. S. exporter a chance to carry on business face to face. In London, over 80 importers, buyers, and

agents signed registration sheets expressing interest in U. S. products and asking for more information. Many of these persons desire to represent U. S. firms.

Meatless Frank Makes Appearance

At the Milan (Italy) Trade Center, 12 U. S. firms supplied 30 different species of frozen, canned, and processed fishery products. Some were known to the Italian market--frozen squid, shrimp, and king crab meat. Others were new--carp roe from the Great Lakes, caviar made from whitefish, canned lobster morsels, canned lisa, canned codfish cakes, frozen chub fillets, and Maine lobsters frozen by a liquid nitrogen process. But the hit was a frankfurter made entirely of freshwater fish. It looked like, tasted like, and was eaten like a meat wiener.

While the frankfurt was a smash in Milan and London, it moves this month to its toughest audience--the one in Frankfurt, Germany.



WATER: THE VITAL ESSENCE

"Three-quarters of the earth's surface is covered by a compound about which man has known very little until recently. Whether falling as spring rain, racing by as a mountain stream, or lying still and black in the Marianas Trench, water has generated, surrounded, and supported life as we know it. More and more, it is becoming the key to new physical knowledge about the planet.

"Water: The Vital Essence," by Peter Briggs (232 pp., printed, \$5.95 a copy. Harper and Row, Publishers, Inc., 49 East 33rd Street, New York, N. Y. 10016) "provides a broad picture--an introduction to the global sea and the freshwater rivers flowing into it, the submarine rivers which move beneath its surface, and the expanding science of oceanography. It offers the layman a review of what is known about underwater geology--the unseen landscape--origins of life on land, the sea as a potential source of energy and food. The reader is also faced with society's very real problems of maintaining an adequate supply of usable fresh water, a subject of tremendous importance for a geometrically increasing population. Everybody can't live upstream."

FEDERAL ACTIONS

Corps of Engineers

DENIES DREDGE PERMIT IN FLORIDA

On March 14, the U. S. Corps of Engineers denied a permit for dredging and filling in Boca Ciega Bay, Florida. The Corps decision was based on the harmful effects of the proposed operation on fish and wildlife resources and the public interest--and its inconsistency with the purposes of the Fish and Wildlife Coordination Act and the Florida Board of Conservation.

The "St. Petersburg Times" cites the decision as a landmark. It is the first time that concern for fish and wildlife resources has been the basis for denying a permit. Before, the Corps of Engineers concerned itself primarily with the effects of dredging and filling on navigation.



Department of Health, Education, and Welfare

FDA WILL REQUIRE MORE PRECISE PACKAGE LABELING

The Food and Drug Administration has proposed regulations requiring every food package to state clearly and exactly "how much" and "what" the customer is buying (The "Federal Register," March 17, 1967). The regulations were formulated under the 1966 Fair Packaging and Labeling Act (PL 89-755) effective July 1, 1967.

The regulations would ban such misleading words as "jumbo quart" or "full gallon."

They would require:

- Listing the form in which a food is offered--"whole, slices, diced, etc."
- Expressing quantities in pounds and ounces, or in gallons, quarts, pints, and fluid ounce subdivisions.
- Labeling packages containing less than four pounds in both ounces and pounds and fractions of pounds or ounces. Example: "A declaration of 1½ pounds weight shall be expressed as "net wt. 24 oz. (1 lb. 8 oz.)," "net wt. 24 oz. (1½ lb.)," or "net wt. 24 oz. (1.5 lb.)."

A package of less than one gallon would be labeled in the largest whole quart or pint; the remainder would be given as a fraction or in fluid ounces.

- Listing ingredients under their common or usual name "in order of decreasing predominance" (in order of amounts).
- Accompanying any statement of the number of servings by the quantity of each serving--"in terms of weight, measure, or numerical count."
- Outer containers, such as "six-packs," to bear the mandatory label information for the product.
- The name and address of the "manufacturer, packer, or distributor" to appear on the "principal display panel" of the package.



Treasury Department

CUSTOMS DETERMINES USSR NOT DUMPING FISHERY PRODUCTS

A tentative determination was made by the U. S. Treasury Department that shrimp, lobster tails and lobsters, fresh frozen or cooked frozen, imported from the Soviet Union, are not now nor are likely to be sold at less than fair value within meaning of Antidumping Act of 1921. (Published in "Federal Register," January 31, 1967.)

In March 1966, the Treasury Department was informed that imported Soviet fishery products were being sold at less than fair value. To check this, the Bureau of Customs began an inquiry based on provisions of the Customs Regulations. Also, it published an Antidumping Proceeding Notice in the "Federal Register," April 19, 1966.

Checked Purchase Price and
Constructed Value

The determination was based on evidence that, for fair value purposes, the appropriate bases for comparison are purchase price and the constructed value of the imported Soviet shrimp. Customs found that the purchase prices of shrimp were in no instance lower than their constructed value.



INTERNATIONAL

FAO Aids 15 Caribbean Countries

Two fishing training vessels of the Food and Agriculture Organization (FAO) became the first of their kind in November 1966 to cross the Pacific under the white-and-light blue United Nations flag. The "Alcyon" and the "Calamar" docked in San Diego, Calif., in November 1966, after a 30-day crossing from Japan. They sailed later for the Caribbean to study the area's marine resources and to train fishermen as part of a major FAO fisheries project of the UN Development Program.

The steel-hulled vessels were built at Yokosuka, Japan. Each is 81 feet long overall, has a capacity of 137 gross tons, and a maximum speed of 11 knots. Both are equipped for side trawling and have a three-ton trawl winch with a hauling speed of 148 feet per minute.

Accommodation is provided for a crew of 10 with more space for 8 trainee fishermen. A small fish hold has a 1,500 cubic foot capacity and is refrigerated down as far as -5° C. (23° F.) using Freon 12 as a refrigerant.

Outline of Project

The "Alcyon" is based at Kingston, Jamaica, and the "Calamar" at Bridgetown, Barbados, headquarters for the FAO project. Participating states and territories are Barbados, Guyana, French Guiana, Guadeloupe, Martinique, Jamaica, the Leeward Islands, Netherlands Antilles, Surinam, Trinidad and Tobago, Grenada, St. Lucia and St. Vincent, the Dominican Republic, and Puerto Rico. Though 12 of the 15 participants are island countries, or constitute chains of islands, none catches as much fish as it needs. Nutrition is generally poor and quality protein is the element most lacking in the diet.

Present Caribbean fishing methods are usually more picturesque than productive. Marketing and distribution are inefficient. There are not enough trained people to exploit the Caribbean's rich fisheries potential. The aim of the 4-year project, therefore, is to build a sound base for future fisheries development. This is to be accomplished through exploratory fishing, marketing studies, and training.

FAO has subcontracted the exploratory fishing phase of the project to BCF. This part of the project will concentrate on areas considered the Caribbean's most promising: The waters off northeast South America, the southern Caribbean, and the grounds along the island chain running from Grenada to Jamaica.

The marketing studies are designed to improve local methods of processing, handling, storage, and distribution of fishery products. They also will explore the possibilities of a Caribbean export trade.

Training will be of great importance. The FAO experts plan to train officers and master fishermen, both ashore and aboard the project's vessels, with courses organized periodically throughout the area.

Total cost of the project will be US\$2.7 million, US\$1.9 million of it contributed by the United Nations Development Program and US\$800,000 by the governments.

FAO's Growing Fleet

The Alcyon and Calamar are the third and fourth training and exploratory fishing vessels to be built for FAO in Japan and form part of a growing fleet of such boats. The first 2 FAO-UN vessels built in Japan were the "Chin Da Li," a 300-ton tuna long-liner, and the 150-ton trawler "Kae Na Li," both named after Korean flowers. They were completed in 1965 and are now in service with the Deep Sea Fishing Training Centre at Pusan, Korea.

The Pusan project chief has reported that the Chin Da Li, manned by Korean trainees who take turns at all shipboard tasks from deckhand to skipper, has registered an average daily tuna catch above that of commercial vessels from Korea and Japan. It turned in a US\$4,000 profit on her first voyage.

Two other vessels are being built in Japan. They are 96-ft. purse seiner/trauliers due for delivery this year. They will be assigned to FAO-UN fisheries projects in the Philippines and East Pakistan.

The cost of the 6 Japanese-built boats is about US\$1.3 million, paid for in Japanese yen. ("Fishing News International," Jan. 1967.)



Fish Meal Exporting Countries Consider Regional Quotas

The Fish Meal Exporters Organization, made up of representatives from Peru, Chile, Norway, Iceland, Angola, and South Africa, is planning regional quotas for shipments of fish meal. These countries account for about 90 percent of world exports of fish meal. Only a specific amount would be exported to each continent, but the quota for the United States is open ended.



Japan and USSR Exceeded 1966 Pacific Salmon Quota

In 1966, Japan caught 101,177 metric tons of salmon (zones A & B combined) and the USSR 56,223 tons, according to the Japanese Fisheries Agency. Japan surpassed by 5.4 percent the quota of 96,000 tons decided at the 1966 Japan-Soviet negotiations. The USSR exceeded by 12.4 percent its goal of 50,000 tons--the first time since 1956 that it exceeded the planned quantity in an even year, normally poor for salmon.

In 1966, the Soviets insisted that salmon resources in the Northern Seas were the smallest in history due to recurring poor catch years. So the Japanese accepted a drastic quota reduction and severe restrictions. However, the catches of both nations were high and the coastal fishing of the USSR especially surpassed the plan considerably. This represents Soviet expansion and also implies that resources were not so scarce as thought. These developments will help Japan in future debates on resources. ("Nihon Keizai," March 2, 1967.)



German-Greenlandic Gear Conflict Increases

Incidents between small Greenland gill-netters and large German trawlers in international waters near Greenland appear to be

increasing. The skipper of a Greenland vessel recently reported losing 22 long lines and nearly been run down by 2 German trawlers. An official of the Royal Greenland Trade Department notes that Greenland's enforcement vessels cannot intervene because the fishing areas are in international waters. He said protests through diplomatic channels had failed to produce results and, if the incidents recur, Greenlanders will be forced to consider whether to continue fishing in the area. ("Aktuelt," Feb. 27, 1967.)



World Fish Meal Output Rose 13% in 1966

World fish meal production in 1966 increased about 13 percent over 1965. Output rose substantially in Peru, Chile, and Norway, but declined in the U.S. Most principal producing countries submit data monthly to the International Association of Fish Meal Manufacturers.

Country	Nov.	Dec.	Jan.-Dec.	
	1966	1966	1966	1965
	..... (Metric Tons)			
Canada	5,413	8,363	88,344	90,387
Denmark	8,964	4,049	107,915	111,189
France	1,100	1,100	13,200	13,200
German Fed. Repub.	6,265	5,428	73,443	67,555
Netherlands	1/	1/	2/1,510	5,894
Spain	I/	I/	-/	3/ 34,000
Sweden	940	483	6,189	7,076
United Kingdom	6,343	6,004	85,906	80,845
United States	17,026	10,391	4/179,101	4/219,807
Angola	5,917	5,016	54,670	47,668
Iceland	20,520	18,567	181,842	172,073
Norway	18,463	2,172	421,725	309,149
Peru	2,337	187,319	1,470,478	1,282,011
So. Afr. (including S.-W. Afr.)	7,990	1,006	257,565	272,388
Belgium	375	375	4,500	4,500
Chile	2,149	3,872	194,221	70,352
Morocco	1/	1/	5/21,300	19,290
Total	103,802	254,145	3,161,909	2,807,384

1/ Data not available.

2/ Data available only for January-April 1966.

3/ Estimated.

4/ Does not include shellfish meal.

5/ Data available only for Jan.-Sept. 1966.

Note: Japan does not report on monthly basis at present. In 1965, her production was 356,000 metric tons, according to FAO's "Yearbook of Fishery Statistics, 1965" vol. 21.



FOREIGN

CANADA

TIGHTENS SEALING REGULATIONS

For the Gulf of St. Lawrence sealing season opening March 7, 1967, the Canadian Government planned to have snow vehicles, 4 helicopters, and more protection officers supervising the hunt.

The Minister of Fisheries explained that the sealing regulations had 2 purposes: one, conservation, the other, strictest control over the manner seals are killed.

The types of firearms and ammunition that may be used to shoot adult seals are clearly defined; so too are the weight and length of the hard-wood clubs used in taking young seals. Sealers may carry the traditional gaff for personal safety, but cannot use it as a weapon. One underlined section states that a seal must not be skinned until there is positively no doubt that it is dead.

Quota and Rules Set

If a violation occurs, a fishery officer now can suspend the license of offenders up to 30 days. In the Gulf area, sealing may only take place between 6 a.m. and 6 p.m. daily, thus confining the hunt to daylight hours.

As in 1966, a 1967 quota of 50,000 has been set in the Gulf for young harp seals commonly known as whitecoats. Killing hood seals and adult harp seals on the breeding patches is prohibited.

A protocol bringing harp and hood seals under international control has been approved by the International Commission for the Northwest Atlantic Fisheries. This will lead to international conservation measures outside the Gulf of St. Lawrence. Inside the Gulf, sealing in 1965 and 1966 was exclusively

Canadian. (Canadian Department of Fisheries, Ottawa, Feb. 24, 1967.)

PLANS WEST COAST FISHERY RESEARCH LABORATORY

The Canadian Government has acquired a site in West Vancouver, British Columbia, to develop a major marine research center, the Fisheries Minister announced February 23, 1967. He described the plans of the Fisheries Research Board for the new area as "long-range," leading in the next decade to the development of one of the nation's finest water laboratories. Facilities will be made available for research on live fish in fresh and salt water.

The new laboratory will operate as part of the Fisheries Research Board's Vancouver Laboratory. (Canadian Department of Fisheries, Ottawa, Feb. 23, 1967.)

HER EXPLORATORY WHALING WITH JAPAN IN ATLANTIC IS SUCCESSFUL

The whaling company Kyokuyo Hoge sent a 750-ton whaling vessel to Newfoundland in May 1966 at the request of the Canadian Government. The vessel took 170 whales (20 above its goal) and produced 2,400 metric tons of meat and oil. The company now plans a joint coastal whaling venture with Canadians in that area.

It was reported in December 1966 that Taiyo also had established a joint whaling company in Canada and would send a 470-ton whaling vessel to Newfoundland. The vessel's target for 1967 (June-September) is 175 blue whales.



LATIN AMERICA

Mexico

FISHERY DEVELOPMENT PLANS

In early 1966, a fisheries advisory commission pointed to the slow increase in the Mexican catch. Its recommendations prompted the government to announce a national development program aimed at raising landings by more than 160 percent--to nearly 500,000 metric tons a year.

The commission observed that Mexican fishing progress has been haphazard and poorly balanced; the industry is too dependent on export markets for shrimp and a few other species.

Shrimp will feature in plans to increase exports from 66,000 metric tons (1964) to 144,000 tons. But Mexico also hopes to increase output of nonfood marine products from 7,000 tons to 61,000 tons. Fish meal will make up nearly 50,000 tons of the 1970 total.

With this drive to increase the catch, Mexico also will encourage its people to eat more fish. Estimates for 1970 put per capita consumption at least at 5.8 kilograms (12.76 pounds).

Large Investments Planned

To achieve its 1970 targets, Mexico plans an investment in fishing of 334 million to 396 million pesos (US\$26.7 million to \$31.7 million) in the next 4 years. Of the higher sum, 234.3 million pesos (US\$18.7 million) will be drawn from current revenue provided by the State; of the remaining 161 million pesos (US\$12.9 million) about 60 percent will be sought abroad and 40 percent at home.

The investment will build larger vessels able to work far out at sea and new processing plants and better facilities for handling wet fish; improve export and domestic marketing methods; help apply improved fishing techniques; and train fishermen.

The program also undertakes the reform of laws governing fisheries and fishing cooperatives, and of regulations presently taxing commercial fishing and the fish trade. It

seeks the coordination of government agencies dealing with fishing under the National Advisory Commission on Fishing. The Commission will be given executive power to direct the development plans it has outlined. ("Fishing News International," Jan. 1967.)



Brazil

PRESIDENT VETOES FISHERIES CODE LEGISLATION

On January 18, President Castello Branco vetoed the entire revision of the fisheries code approved by the Brazilian Congress. He said that amendments had so distorted the Administration's original text that partial veto was impossible. Another revision of the obsolete 1938 Fisheries Code is being prepared by the numerous government agencies concerned with the fisheries industry.

The President stated that the bill approved by Congress was contrary to the national interest. He pointed out that Article 8 of the original draft he presented to Congress in September 1966 permitted foreign vessels to fish in Brazilian waters when authorized by Executive Decree. As revised by Congress, Article 8 was limited to firms with headquarters in Brazil that would be permitted to charter foreign fishing vessels for one year, renewable for only another year, then the vessels either were to be nationalized or cease fishing in Brazilian waters. This wording, according to the President, destroyed the flexibility desired by the Administration.

Financial Burden To Government Excessive

The President also stated that the fiscal incentives for investment in the fisheries industry that the original bill provided now would be too great a burden for the Treasury to bear on top of the recently granted 25 percent wage increase for civil servants. To be able to meet that additional new expense, without issuing more currency, the government is reducing fiscal incentives granted other activities under previous legislation. Accordingly, incentives for the fisheries industry are no longer justified. (U.S. Embassy, Rio de Janeiro, Feb. 9, 1967.)

Brazil (Contd.):

LEAFLET DISCUSSES MARINE FISHING IN NORTHEAST BRAZIL

The fishing industry, like most others in Northeast Brazil, is technologically and commercially far behind those of most developed countries, according to a new leaflet on the region. Many available resources are unexploited; processing and marketing facilities are few. Lobster is found along the Continental Shelf off the states of Ceara, Rio Grande do Norte, Paraiba, and Pernambuco. The report includes catches of various species, development plans of SUDENE (Superintendency for Development of the Northeast) and tables on vessels, processing companies, fishing colonies, warehouses and cold storage plants.

Note: FFL-69, "Marine Fishing in Northeast Brazil," is available free from the Branch of Foreign Fisheries, BCF, Room 8015, U. S. Department of the Interior, Washington, D. C. 20240.



Cuba

MEXICO SEIZES VESSELS

On Feb. 6, 1967, a Mexican Coast Guard patrol boat seized 6 Cuban fishing vessels inside Mexico's territorial waters near Progreso, Yucatan Peninsula. The boats are being held at Progreso while the Mexican Government considers further action.

* * *

FISHES OFF ARGENTINA

The "Guasa," a Cuban freezer trawler recently purchased from Spain, has returned to the new fishing port of Havana after a 2½-month trip to the Patagonian Shelf. Commanded by a Soviet fishing captain, the vessel had 460 metric tons of southwest Atlantic hake.

* * *

CUBA AND USSR AGREE ON SERVICING SOVIET VESSELS

Cuba and the USSR have agreed on the servicing of Soviet fishing vessels by Cuban enterprises of Havana's fishing port. This

will improve the work of the Soviet fishing fleet in the southwestern Atlantic and permit full-capacity use of fishing port facilities. The agreement was signed by V. V. Sokolov, representative of the USSR Ministry of Fisheries in Cuba, and Alvaro Lavastida Rosado, director of the Havana fishing port. ("Tass," Feb. 16, 1967.)



Argentina

SOVIET FISHING CAUSES PROBLEMS

Several Argentine high-seas fishing vessels returned unexpectedly to Mar del Plata complaining that the physical presence of large Soviet fishing vessels makes their fishing difficult and hazardous. The Argentine captains lodged a protest with the local National Maritime Prefecture claiming they were unable to fish for the same schools of fish since Soviet fishermen use the "mass concentration of vessels" technique, and that high waves created by larger Soviet vessels endangered the smaller Argentine vessels.



Peru

SETS CLOSED SEASON FOR ANCHOVY FISHING

On February 11, 1967, as a conservation measure to protect the anchovy (*Engraulis ringens*), the Peruvian Government published supreme decree no. 16. This ordered: (a) current fishing season--September 1, 1966, to August 31, 1967; (b) closed fishing season--February 15, 1967, to March 14, 1967; and (c) financial assistance for small and medium-size fish-meal producing firms during the closed season be given by the Industrial Bank and Ministry of Treasury and Commerce.

A recommendation on limiting the anchovy catch to 8 million metric tons during the current season is expected to be made in May 1967 by the Ocean Institute (Instituto del Mar). Possibly, the Ocean Institute may recommend an increase in catch if environmental factors are favorable. Some producers favor increasing the permissible catch. However, at the current rate of fish meal production,

Peru (Contd.):

and sales allocations by the end of May 1967, stocks may stand at over 750,000 tons. (U.S. Embassy, Lima, Feb. 13, 1967.)

4 GROUPS WILL SELL FISH MEAL

The independent fish meal producers of Peru account for about 50 percent of the total national production. They were expected to organize into 3 groups similar to the Peruvian Fishery Consortium (Consorcio Pesquero del Peru) to obtain more favorable market prices for fish meal produced. Besides the Peruvian Fishery Consortium, these similar organizations were expected to be functioning soon: (1) The National Union of Fish Meal Producers (Sindicato Nacional de Productores de Harina de Pescado S.A.), (2) the Association of Fisheries (Pesqueros Asociados S.A.), and (3) the Fish Meal Producers Association (Asociacion de Productores de Harina de Pescado S.A.). ("Pesca," Nov. 1966.)



Chile

200-MILE LIMIT RESERVATIONS

A Chilean Foreign Ministry official recently said that Chile's adherence to the 1952 Declaration of Santiago is as firm as ever, but she does not actually claim sovereignty over the 200-mile zone. Rather, she claims jurisdiction for the exclusive purpose of protecting natural resources.

A recent editorial in "Diario Ilustrado" contends that Chile's position must be aligned with that of Peru and Ecuador, which make no reservations in their claim to full sovereignty. It also noted Argentina's recent adoption of a 200-mile maritime jurisdiction. (U. S. Embassy, Santiago, Feb. 1, 1967.)



Ecuador

SEIZES JAPANESE TUNA VESSEL

The Ecuadorean Navy seized the Japanese tuna long-liner "Chiyo Maru No. 15" (410

gross tons) February 17, 1967, on charges of violating the 200-mile territorial waters. On February 24, the Government announced that the vessel owners would be subject to a fine of US\$12,777.60--and the vessel would be confiscated if payment was not made by March 1. Also, Ecuador is requiring the purchase of a \$2,640 license and a fishing fee of \$200 if the vessel desires to continue fishing inside territorial waters.

This is the second Japanese fishing vessel seized by Ecuador on charges of illegal fishing. The first incident occurred 3 years ago. ("Minato Shimbun," Feb. 28 & 19, 1967.)



Colombia

CONSIDERS 200-MILE TERRITORIAL SEA

A Colombian Senate committee has approved a bill extending territorial waters to 200 miles. The full Senate reportedly was scheduled to vote on the bill the week of Feb. 19, 1967. (Bogota, Feb. 16, 1967.)



Panama

REQUIRES SAILING PERMIT FOR FISHING VESSELS

Panamanian Law No. 5, January 17, 1967, requires a "sailing permit" ("zarpe de pesca") for shrimp boats and fishing vessels over 10 gross tons leaving Panamanian ports for shrimp or any other fishing operation. (Foreign ships of this size may be affected.) Although no charge is levied for the permit, tax stamps of US\$20 and \$40 must be affixed to sailing permit applications for shrimp and fishing vessels using nets, respectively. For other fishing activities, the tax stamp will also be \$20 or \$40, depending on the fishing operation. Craft under 10 gross tons are exempt.

This sailing permit is no substitute for a fishing license. A valid fishing license must still be held by the operator of a fishing craft.

Applicants must present these documents to support their request: (a) sailing permit application in duplicate; (b) certificate of inspection for vessel; and (c) list in triplicate

Panama (Contd.):

of crew and passengers, if any. Applications will be available from head of Department of Fisheries, Ministry of Agriculture, Commerce, and Industries in the near future. Ship operators will normally obtain applications from the Ministry. The local official of Department of Fisheries in a port will issue the sailing permit; in ports with no Department representative, the Port Inspector, Mayor, or other local magistrate, in order of availability, will be the issuing officer.

Law Designed To Raise Funds

The sailing permits will be valid for 30 days. The law provides for semiannual inspection of all affected craft and enforcement of the sailing permit requirement. Also, for the present, no increase in shrimp vessels licensed to operate will be allowed. The present total is 232, virtually all Panamanian owned. Presumably, the issuance of an operating license to a new shrimp vessel would be possible only if one now active retired.

The law is designed to raise additional funds to "contribute to the realization of" Panama's participation in the 6-year FAO study of Central America's fisheries potential underwritten by the U.N. Development Program. Participating countries, including Panama, have contributed to it. However, the new law does not earmark proceeds of the sailing permit tax stamps in any way. Apparently, Panama's contribution to the study eventually will be taken from the regular budget of the Fisheries Department. (U. S. Embassy, Panama, Feb. 17, 1967.)



El Salvador

1966 SHRIMP LANDINGS WERE RECORD

A new BCF leaflet discloses that during 1966 El Salvador's shrimp fleet landed a record total of over 11.9 million pounds--40% above the previous record of 1961 and 43% above 1965. The catch of fish and other shellfish, taken incidental to the shrimp, also continued to grow; in 1966, it reached a record 3.9 million pounds.

While no sales figures are available, personal observation confirms increasing quan-

ties of fish and other seafood in local markets. Probably due to the increased availability of shrimp, less fishing effort was required in 1965 and 1966 than in most previous years. During 1965, an average 65 boats logged about 19,000 fishing days. During the first 11 months of 1966, 67 boats spent 19,000 days fishing.

The leaflet also discusses catch, exports and consumption, prospects, and a statistical table on the shrimp industry.

Note: FFL-113--"El Salvador Shrimp Industry, 1965-1966," is available free from the Branch of Foreign Fisheries, BCF, Room 8015, U. S. Department of the Interior, Washington, D. C. 20240.



Foreign Fishing Vessels Seized Off Latin America

In the second half of February, U. S. tuna vessels were seized off Ecuador and Peru; French vessels were arrested off Brazil; Cuban and U. S. vessels were seized off Mexico; a Japanese vessel was seized about 180 miles off Ecuador; and Soviet vessels off Argentina were required to adhere to the regulations of that nation's unilaterally established 200-mile maritime jurisdiction.

Vessel arrests off Latin American coasts are increasing and posing serious problems for several countries.



MID EAST

Israel

PLANS TUNA FISHING AND PROCESSING

Israel is reported seeking information from Japan concerning the economics of tuna vessel and tuna packing operations. The Marine Research Laboratory in Hiroshima was asked by the Israeli Science and Technology Information Center for data on production capacity and efficiency of tuna vessels, operating costs, types of fishing gear, and estimated investment and space requirements to build a tuna cannery with a processing capacity of 2,000-5,000 tons a year. ("Suisan Keizai Shimbun," Feb. 7, 1967.)



EUROPE

EUROPEAN PURSE-SEINE METHODS SPREAD TO DENMARK AND WEST GERMANY

The success of the Norwegians and Icelanders with the purse seiner has stimulated its increasing use by European fishing fleets. Recently, Denmark and West Germany put into service vessels using large purse-seine nets and power blocks.

In Denmark, the side-trawler "Else Horne," fitted with purse-seine equipment, has been landing good catches at Hirtshals, her home port. In December 1966, the 140-foot "Caroline Musholm" was delivered to Danish owners by a Norwegian shipyard. She is the first power-block purse seiner built for Denmark and the fishing fleet's largest vessel.

W. Germany Adopts Purse Seiner

In West Germany, the 825-ton trawler "Schellfisch" has been converted into a power-block purse seiner, the world's longest.

The vessel will debut on the herring grounds off Iceland. German trawler operators will then be able to compare the purse seine with the midwater trawl.

Another vessel able to fish purse-seine gear will soon enter service with the same fleet. She is the stern trawler/purse seiner "Milly Ekkenga," just completed at Woubrugge, Holland. Somewhat smaller than the "Schellfisch," she is about 560 tons and has $\frac{3}{4}$ length shelterdeck. She will be able to undertake bottom and midwater trawling operations--and purse seining. ("Fishing News International," Feb. 1967, and "World Fishing," Feb. 1967.)



USSR

SOVIETS FAIL TO REACH 1966 CATCH QUOTA

In 1966, the Soviet catch of fish, shellfish, marine mammals, and other aquatic products amounted to 6 million metric tons ("Pravda," Jan. 29, 1967, p. 2). The 1966 planned quota was 6.2 million metric tons, 10.7 percent more than the 1965 plan.

This is the first time since the 1950s that the USSR failed to fulfill the catch quota. In recent years actual landings surpassed planned catch by an average of about 5 percent, but this average was decreasing during 1964 and 1965.

The Pravda article, prepared by the Soviet Central Statistical Office, claimed fulfillment of the 1966 fishery catch quota by 100.7 percent. However, Soviet Minister of Fisheries A. A. Ishkov, writing in the official organ of the Ministry of Fisheries, "Rybnoe Khoziaistvo," January 1966, page 2, stated: "In compliance with the 1966 Plan for the Development of the Soviet National Economy, confirmed at the 6th session of the Supreme Soviet, the fishing industry will have to increase fishery landings to 6.2 million metric tons and the output of fishery products to 3.05 million tons." So, the 1966 catch reached only 96.8 percent of the originally set quota.

* * *

2.6 MILLION KING CRABS LANDED IN EASTERN BERING SEA

In 1966, the Soviet Union's Far Eastern fishermen landed 2.6 million adult male crabs and produced 104,754 cases (48 8-oz. cans) of canned crab meat. The Soviets fished in the eastern Bering Sea from March to June. They used 3 king crab factoryships accompanied by 9 net-setting medium side trawlers and 33 pick-up boats, the same number as in 1963-1965. Because they fished an additional month, there was a 15 percent increase from the 1965 canned pack of 90,020 cases.

The February 1965 U.S.-USSR King Crab Agreement set a quota of 118,600 cases for the 1965-1966 Soviet Eastern Bering Sea fishery. In 1965, the Soviets reached 75.9 percent of the canned pack quota, and in 1966 about 88 percent. During the recent 1967 negotiations, the U. S. suggested a 15-percent decrease in the Soviet Eastern Bering Sea pack, permitting the USSR to produce 100,000 cases of canned crab meat during the 1967 and 1968 seasons.

The Soviet Union will do her best to reach the quota despite the fact that the Eastern Bering Sea fishery is not very "profitable," especially when compared to highly "profit-

USSR (Contd.):

Soviet Fishing for King Crab in the Eastern Bering Sea (Bristol Bay), 1959-1966									
Year	Months Fished	Number of Vessels				Tangle Nets Set	Average Time for Set	Male Adult King Crabs	Canned Pack ^{3/}
		Factoryships	SRT Medium Trawlers ^{1/}	Motor Boats ^{2/}	Total				
						Tons	Hours	Lbs.	No. of Cases
1966	March-June	3	9	33	45	617,195	330.0	2,559,598	52,377
1965	April-June	3	9	33	45	618,689	132.5	2,225,567	45,010
1964	April-July	3	9	33	45	607,459	136.6	2,799,620	72,104
1963	April-July	3	6	33	42	536,139	162.1	3,019,417	76,369
1962	April-July	2	6	22	30	419,667	110.5	3,019,211	72,160
1961	April-July	2	6	21	29	387,976	128.1	3,441,314	73,154
1960	April-July	1	6	10	14	191,559	94.0	1,995,006	37,722
1959	July-Sept.	1	-	8	9	63,950	95.0	620,406	7,961

1/Crew of 22, of which 10 are king crab fishermen.

2/Crew of 12, of which 10 are king crab fishermen.

3/Each case contains 96 $\frac{1}{2}$ -lb. cans.

Source: Ministry of Fisheries, USSR.

¹/Crew of 22, of which 10 are king crab fishermen.

²/Crew of 12, of which 10 are king crab fishermen.

³/Each case contains 96 $\frac{1}{2}$ -lb. cans.

Source: Ministry of Fisheries, USSR.

able" bottom fisheries in the Gulf of Alaska, off the Pacific Northeast, and in the Bering Sea. Canned king crab meat is one of the most important Soviet exports; in 1965, over 10 million rubles¹ worth were sold to Western European countries, 3 times higher than 1965 caviar exports, and about one-fifth the value of all fishery exports.

* * *

PACIFIC FISHERIES MAKE GEAR ADVANCES

The Experimental Design Bureau of the Soviet Far Eastern Fisheries Administration recently tested a new design for a detachable cod end. Soviet fishermen use detachable cod ends in their high-seas fishery operations. Full cod ends are left floating on the surface to be picked up later by refrigerated fish transports. Meanwhile, trawlers continue fishing.

Detachable cod ends are not used by U. S. fishermen, but West European fishermen use them extensively in high-seas stern trawler operations.

Soviet-made tuna long lines are another recent innovation of the Design Bureau. In the past, the Soviets bought long lines from Japan but, in early February 1967, the fishing gear plant at Nakhodka delivered to the Far Eastern tuna fleets the first tuna long lines made of domestic synthetic materials.

* * *

SCIENTIST DISCUSSES ATLANTIC RESEARCH

The December 1966 issue of the Soviet magazine "Niva" contains an interview with the Deputy Director of the Soviet Atlantic Scientific Research Institute for Fisheries and Oceanography (ATLANTNIRO). Here are some highlights:

"The ocean is not a forest, nor is the fisherman a hunter who can 'comb' a wood in an hour or so in search for game. For this reason a diversified network of specialized scientific research institutes has been set up to help the fishermen. The field of our explorations is virtually boundless--the world ocean which covers more than 70 percent of the surface of the earth. Fishing is a widely developed industry providing employment for at least 100 million people all over the world.

"Soviet fishery scientists have 'divided' the vast expanses of the seas and oceans into several zones: the Pacific Ocean is the province of the Vladivostok Fisheries Institute; the Norwegian Sea and the North Atlantic of the Murmansk Institute of Polar Studies; and the Caspian Sea of the Astrakhan Institute of Fisheries. ATLANTNIRO covers the remainder of the Atlantic from 23° North down to Antarctica. About 15 or 20 years ago we had a staff of only 20 scientists who were engaged in the study of the southern Baltic Sea. Today the catch has increased considerably, consequently our institute has expanded too..."

USSR (Contd.):

It Locates and Studies Fish

"Our institute is a branch institute. Its main object is to locate and study fish. More than 20 specialized research vessels cruise far from home the year-round exploring the seas. But their activity is not limited to exploration alone. Locating fish is not the same as catching fish which migrate in search of zones abounding in food. . . . Our scientists study the oxygen content in ocean water, they measure its temperature and establish its salinity. This apparently mechanical collection of information, conducted with great patience and care, makes it possible to establish the typical behavior of fish and the dependence of fish on the medium."

"There is a very good term for defining the character of our investigations. It is 'long-term exploration.' It means that the research vessels are sometimes compelled to operate intensively as regular fishing vessels. For instance, if fish has been located in zone A it is necessary to find out what kind of fish, whether there is only one shoal or more, or there are several local shoals. Perhaps, it might be a whole school of fish. To find the answers to these questions the zone is carefully explored. The scientists study the food conditions which are so important in determining the behavior of fish, the relief of the bottom, and the composition of the sea bed. In short, the probable fishery is described in the greatest detail.

"At the same time fishing is conducted on a commercial scale to ascertain the potentialities, the number of vessels that can operate there simultaneously, and the length of the fishing season. It is difficult to overestimate the significance of such recommendations. It is worth noting that economic considerations are not the least important. . . ."

Designing Fishing Gear

The Soviet scientist discussed the work of various laboratories and the important role of the Laboratory for the Experimental Design of Fishing Gear:

"The designers, electronic engineers and gear experts have set themselves the following goal: to design fishing gear which would enable the master or engineer to perform all fish-hauling operations from the bridge. The

readings on the instruments would show him the depth to which the trawl has been submerged, they would show whether the trawl is open, and whether it has been filled with fish. Despite the fact that the trawl is still the main catching gear, there is still much that we do not know about its operation. For instance, we do not yet know how the fish behaves after it has been caught. To know this you must see the trawl in operation. Our designers are using a special underwater glider equipped with lighting instruments, cameras and movie cameras. When towed, the glider is worked by an operator who observes the behavior of the fish in the trawl and registers it on movies. We have thus discovered very interesting and important details which are essential for the designers of fishing gear. . . ."

* * *

RESEARCH VESSEL RETURNS FROM SOUTHWEST ATLANTIC

The large stern factory trawler "Gizhiga," a research vessel of the Atlantic Scientific Research Institute for Fisheries and Oceanography (ATLANTNIRO), returned to the USSR in January 1967 from a long voyage to the southwestern Atlantic. During the 34,500-mile trip, its scientists studied 16,000 fish, and conducted 440 experimental trawlings and over 300 bottom soundings. Preliminary analysis of the research shows that rich fishery resources exist in the area. ATLANTNIRO intends to continue the studies.

In March 1966, the Gizhiga docked at Aberdeen, Great Britain, for fresh water and stores. The Soviet scientists visited the Marine Laboratory at Torry, where they compared notes on deep-water fishing.

In late summer 1966 Soviet fishing vessels began to exploit fishery resources off Argentina.

* * *

SENDS RESEARCH VESSEL TO NORTHWESTERN ATLANTIC

The flagship "Sevastopol" of the Polar Scientific Institute for Fisheries and Oceanography (PINRO) left Murmansk at the end of February 1967 for a research cruise to the northwestern Atlantic. The main purpose will be to study the locations of commercial concentrations and feeding and spawning habits

USSR (Contd.):

of cod, ocean perch, haddock, and other species off Labrador and Newfoundland. The northern boundary of the warm Gulf Stream and its effect on fish populations also will be studied. The vessel will resupply at St. John's, Newfoundland, where Soviet scientists will meet with Canadian biologists of the local fisheries laboratory.

The Sevastopol traditionally conducts research, with the Soviet research vessels "Neptun" and "Topseda" in subareas 1, 2, and 3 of the International Convention for the Northwest Atlantic Fisheries. In 1965, her scientists studied the biology of cod, ocean perch, and haddock. By counting the young, the PINRO scientists hope to obtain data necessary for long-term catch forecasts.

Note: One of Sevastopol's 1966 cruises was reported in Commercial Fisheries Review, June 1966, pp. 91-92.

* * *

OCEANOGRAPHIC VESSEL
VISITS SENEGAL

On January 30, 1967, the newest Soviet oceanographic research vessel, "Akademik Kurchatov," docked at Dakar, Senegal, during her maiden voyage in the Atlantic. A. S. Monin, Director of the Soviet Institute of Oceanology and leader of the scientific party, held a press conference and described the research done. Over 1,000 persons visited the vessel's research laboratories during the 4-day port stay.

During the return trip to her home port of Odessa, the 6,800-gross-ton vessel stopped at Gibraltar, where the scientists met with the famous French oceanographer Cousteau.

Later in the year, according to the U. S. Embassy in Moscow, the vessel will be displayed at the Montreal World's Fair.

* * *

TUNA CONFERENCE
IS HELD IN LENINGRAD

In late January, or early February 1967, a conference on tuna fishing was held at Leningrad. Reportedly, it was sponsored by GIPRORYBFLOT, an organization of the Soviet Ministry of Fisheries in charge of new designs for constructing fishing vessels. The

participants reviewed the results of Soviet tuna fishing with 5 Japanese-built vessels and discussed the changes needed to improve the operation of the vessels. The conference decided that the Soviet tuna fishery should be developed further and new tuna vessels built.

* * *

HELPS YEMEN SET UP RED SEA PLANT

Yemeni newspapers report that the Soviets are helping Yemen set up a US\$11 million fish-processing plant in the Red Sea port of Hodeida. Earlier statements by the Yemen Government said the project would include a fish cannery, a freezing plant with a daily capacity of 55 metric tons, and storage for 1,000 tons of frozen fish.

Reportedly, the Soviets will supply 7 fishing vessels, and 14 to 16 technicians will accompany each vessel to train Yemeni fishermen. The processing plant is expected to provide an export surplus, part of which may go to the USSR as repayment for construction credits. (U. S. Embassy, Sanaa, Jan. 31, 1967, and other sources.)

* * *

STERN TRAWLER SINKS OFF DENMARK

The large sterntrawler RTM-7002 "Tukan" sank on February 28, 1967, in the storm-swept Skagerrak Strait, a short distance from the Danish west-coast fishing port of Helsingør. The 2,368-gross-ton "Tropik"-class vessel, built in 1962, was the second in a series of 67 similar freezer trawlers built for the Soviets in East Germany.

Only 22 of the crew were saved; 57 fishermen died, some after being rescued. Survivors said the ship began to sink after being damaged by a violent cross-wave. The press attaché of the Soviet Embassy in Copenhagen reported that the vessel carried a deckload of heavy timbers which broke loose while crewmen were attempting to don life vests and launch lifeboats. Several crew members were injured by the shifting timbers, some severely. As a result, only 2 lifeboats were launched and many of the crew had to jump into the frigid waters.

The attaché said further that the Tukan will probably be raised.

USSR (Contd.):

Soon after the accident, the Soviet rescue tug "Strogii" took station above the sunken vessel. ("Berlingske Tidende," Mar. 2, 1967.)



Poland

REPORT ON
NORTHWEST ATLANTIC FISHERIES

Poland began to fish in the Northwest Atlantic in 1961. In that first year, about 4,000 metric tons of various species, mostly ocean perch (redfish) and cod, were landed (table 1). By 1965, over 56,000 tons (also mostly ocean perch and cod) were caught--14 times more than in 1961. The Northwest catch made up 20 percent of total landings of 280,097 tons in 1965.

Species	1965	1964	1963	1962	1961
	(Metric Tons)				
Cod	21,720	10,865	7,736	4,161	1,222
Redfish	24,708	21,414	12,975	4,070	2,378
Flatfish	6,338	2,981	2,193	451	300
Other	3,862	2,583	344	439	23
Total	56,628	37,843	23,248	9,121	3,923

The Polish fleet in the Northwest Atlantic consists mostly of large stern factory trawlers (2,600 gross tons) constructed in Polish shipyards. They are equipped with 2,400 hp. motors and automated cod and ocean perch filleting lines capable of processing 50 metric tons of raw fish a day. The maximum freezing capacity of tunnels on a stern trawler is 30 tons of fish a day, while the fish meal plant can absorb about 25 tons of raw fish a day. (These data probably refer to three 8-hour shifts.)

In 1965, 11 stern trawlers caught over 50,000 tons of fish in the Northwest Atlantic--a yearly average of about 4,500 tons (10 million pounds) per stern trawler. The remaining 10 percent of the catch was landed by smaller trawlers which, in 1965, were used mainly in the herring fishery in the Gulf of Maine and off Nova Scotia.

They Fish The Whole Northwest Atlantic

The Poles fish throughout the Northwest Atlantic--from the tip of Greenland and the Davis Strait to Georges Bank off New England.

In 1965, the best daily average catches of factory trawlers were made off the coast of Labrador (subarea 1 of ICNAF) and the lowest on the Grand Banks (see table 2). If catches in one area are low during the year, the Poles prefer not to fish there the next year. This happened in 1962 on Georges Bank, and in 1963 off Nova Scotia. The average daily catch per factory stern trawler in 1965 was 25.9 metric tons (about 57,000 pounds). This high output justifies the expense of building and operating factory and freezer stern trawlers whose sea endurance is 90 days. The cost of building a high-seas fishing factory trawler equals that of 24 large cutters or 4 side motor trawlers operating in less distant grounds. The crew of a factory stern trawler is 11 times the crew of a fishing cutter and 3.5 times a side trawler's.

Fishing Ground	1965	1964	1963	1962
	Metric Tons (Per Day of Fishing)			
Greenland (Davis Strait)	-	23.8	17.6	27.2
Labrador Coast	29.1	26.0	23.0	28.9
Newfoundland (Grand Banks)	22.6	26.8	27.9	20.2
Nova Scotia (Sable Island)	-	-	11.1	-
Gulf of Maine and Georges Bank	27.6	21.2	-	11.5
Average	25.9	26.0	26.6	21.8

The annual operating costs of a factory stern trawler are 14 times those of a cutter and 3 times those of a large side trawler operating in the North Sea. Notwithstanding these enormous differences in capital and manpower, the operating costs per unit of production are not greatly different.

What It Costs To Land A Fish

During 1963-65, it cost about 6,000 zloty (US\$250.00) to produce 1 metric ton of fish--from nearby Baltic fishing grounds to Polish ports--and only 6,150 zloty (\$256.00) to land 1 ton of fish from the distant Northwest Atlantic (table 3). In other words, 1 kilogram (2.2 pounds) of landed fish cost 25 U. S. cents in the Baltic and 25.6 cents in the Northwest Atlantic. The operational costs in the North Sea were much greater (35.4 U. S. cents per kilogram).

Fishing Region	Initial Cost	Operating Costs	Manpower Needed
	(Polish Zloty/L) . . .		
Baltic	15,000	6,000	0.35
North Sea	24,000	8,500	0.45
North-West Atlantic	22,000	6,150	0.20
1/24.00 zloty equals US\$1.00.			

Poland (Contd.):

The "initial"¹/ production costs, lowest for small, inexpensive fishing cutters fishing in the Baltic, are much higher in the North Sea (\$1,000 per 1 metric ton) and only a little less for factory stern trawlers fishing in the Northwest Atlantic (about \$910 a ton).

Higher initial expenses for trawlers, however, are offset entirely by lower manpower needs. During 1963-65, only 2 manpower units were needed to produce 100 tons of fish in the Northwest Atlantic, 3.5 units in the Baltic, and 4.5 units in the North Sea. So it is twice as expensive in salaries, fishermen's benefits, and insurance to fish in the North Sea as it is in the Northwest Atlantic. These costs reflect the average catch per man: in the Baltic, each Polish fisherman catches 30 metric tons; in the North Sea, 22 tons; and in the Northwest Atlantic, 50 tons. (Note: The period during which these quantities were landed is not given in the original text, but it is believed to be 1 year.)

The data show clearly that the profitability of fishing in areas greatly distant from home ports depends on a consistently high rate of landings. The Poles have achieved this in the Northwest Atlantic and intend to further expand their fishery there. ("Polish Maritime News," Dec. 1966, and other sources.)

¹/Possibly means "capital investment."



Denmark

1966 CATCH REACHED 1965 LEVEL

The 1966 Danish fish catch reached the 1965 level of about 800,000 metric tons despite a slow start. Generally, higher prices enhanced the catch value. Exports of fishery products were slightly greater than 1965's record US\$124 million, although quantity was slightly less.

Cod Fillets and Blocks: Danish exports of fresh and frozen fillets and blocks of cod and cod-like fish totaled 48 million pounds in 1966 and 46 million pounds in 1965. Exports to the U. S. increased sharply in 1966.

Prices for cod fillets and blocks weakened considerably during the second half, which could divert supplies to European markets and reduce their exports to the U. S.

Pond Trout: Exports totaled 22 million pounds in 1966 and 23 million pounds in 1965. Shipments to the U. S. accounted for 1.8 million pounds in 1966 and 1.5 million pounds in 1965.

Purse-seine Gear: The industry has taken initial steps to enter the new purse-seine fishery for herring and mackerel. Excellent success with the new gear late in the year points toward increasing participation in those fisheries during 1967. (U. S. Embassy, Copenhagen, Jan. 27, 1967, and other sources.)

* * *

GREENLAND AND DENMARK HAVE COD MARKETING PROBLEMS

Declining prices for frozen cod fillets and blocks in the U. S. market continue to trouble the Danish fishing industry. Danish sellers say the price declined about 25 percent over the winter--and they are seeking other markets. For example, Danish exporters recently signed contracts to sell cod fillets to Hungarian and Czechoslovakian markets, although these markets will in no way compensate for U. S. sales.

Danish fishermen find prices in British ports somewhat better than at home and they now seek to land more fish in Britain.

Sweden also is affected by the problem. Her dealers claim that Denmark is exporting cod fillets to Sweden at prices considerably lower than those Swedish fishermen must receive.

Reports also indicate concern about decreasing Faroese exports of frozen cod fillets to the U. S. and of iced fish to Great Britain.

Greenland Industry Suffers Price Decline

During the winter, the Greenland fishing industry experienced a price decline of 6 U. S. cents a pound for frozen cod fillets. The Royal Greenland Trade Department is working on plans for various countermeasures, including a change in the type of product. Since the price of a fully finished product would be more stable, consideration is being given to changing over to production of deep-fried fillets for export. ("Vestkysten," and "Dansk Fiskeritidende," various dates and "Børsen," Feb. 16, 1967.)

* * *

Denmark (Contd.):

CONFERENCE CONSIDERS NEW RED SHRIMP PRODUCTS

The Danish Fisheries Ministry invited leaders of the country's shrimp industry to a symposium in late March to consider rising use of deep-water red shrimp (*Pandalus borealis*). The annual catch in Danish and Greenland waters passed 10,000 metric tons in 1965. Catches are expected to rise further during the coming year, particularly in Greenland. There, important new shrimp grounds have been found at Disko Bay and at several locations on the southern part of the west coast.

The largest part of the catch is now being canned, but vacuum-packed frozen shrimp have recently become important. The variety in shrimp products will increase during the coming months with the appearance on the market of vacuum-packed pasteurized shrimp in both frozen and chilled forms. ("Dansk Fiskeritidende," Feb. 17, 1967.)

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COD ARE SCARCE IN NORTH SEA

The cod fishery in the North Sea normally peaks in January and February, but the catch this year has dropped significantly from recent years. Many Danish fishing captains after cod have given up completely. However, the poor catches have not resulted in higher prices on the West Jutland fish auctions because of the high level of frozen stocks on the world market. Danish cod in overseas markets are meeting hard competition, especially from Canada and Iceland. ("Politiken," Jan. 29, 1967.)



Greenland

LAUNCHES RESEARCH VESSEL

The 200-gross-ton steel research vessel "Adolph Jensen" was launched at Frederikshavn, Denmark, on January 31, 1967. The vessel was built for fishery research in Greenland waters. It will have special equipment, including laboratory space and accommodations for 6 biologists.

The new vessel, which replaces an older, much smaller research cutter of the same name, will permit investigations in the large fishing banks off Greenland's west coast, where the most important fisheries are found. ("Børsen," Jan. 28, 1967.)

* * *

ORDERS STERN TRAWLER FROM NORWAY

The Royal Greenland Trade Department (RGTD) has ordered a stern trawler of 499 gross tons from a shipyard in Florø, Norway. It will be 50 meters (164 feet) long and 9 meters (29.5 feet) wide, carry a crew of 28, and fish in the Atlantic north of 59° N. latitude. Twin engines will produce a total of 2,200 horsepower. Delivery will be made in early 1969.

The RGTD has studied thoroughly the productive potential of a larger trawler in Greenland waters and the capabilities of other-sized vessels for this operation. ("Børsen," Feb. 17, 1967.)



Norway

1966 NORWEGIAN EXPORTS UP 10% OVER 1965

The value of Norwegian exports of fishery products in 1966 was a record US\$225 million, about 10.5 percent over 1965. In 1966, exports were up for frozen herring and herring fish oil, while exports of frozen fillets, canned fishery products, and fish meal were about the same as in 1965.

Frozen Fillets: Shipments of cod fillets, the leading item in the group, were about the same in both years. In 1966, there was an export gain in haddock and herring fillets that offset a shipment decline in fillets of coalfish and other species.

Canned Fish: Higher exports of canned brisling partly offset a drop in small sild shipments; 1966 was a good brisling season, but there was a shortage of small sild supplies early in the year.

Industrial Products: The increase in herring oil exports reflects the increase in out-

Norway (Contd.):

put of the reduction factories. Fish meal production rose sharply in 1966, although actual shipments of fish meal were about the same as 1965. This resulted in a stock buildup toward the end of 1966, which led to a ban on industrial fishing in November and December. However, sales contracts for stocks on hand had been arranged by late 1966, according to the Norwegian reduction industry. ("Fiskets Gang," Jan. 26 & 27, 1967, and other sources.)

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REDUCES EXVESSEL PRICES FOR INDUSTRIAL FISH

Norwegian exvessel prices in 1967 for reduction fish were reduced one-third or more from 1966 prices by the fishermen's marketing organizations and the processors. The new basic prices for the 3 most important species are:

Winter herring (fat content 18 percent)
US\$23 a metric ton.

Capelin (fat content 2.7 percent) US\$10.25
a metric ton.

Mackerel (fat content 18 percent)
US\$27.50 a metric ton.

Prices will be adjusted for fat content differing from the specified basic content. For each percent of fat per metric ton, the adjustment will be \$1.28 for winter herring, \$1.18 for capelin, and \$1.21 for mackerel.

The price cuts were made because of reduced prices on the world market for fish meal and oil. According to press reports, the announcement of the reductions has caused concern in Norwegian fisheries circles. Fishermen representing 400 purse seiners have sent a resolution to the Fishermen's Union asking state subsidies for fish delivered to the reduction plants. (U. S. Embassy, Oslo, Feb. 5, 1967.)



Iceland

BANS TRAWLING WITHIN 12-MILE FISHING LIMIT

Iceland's Fishery Minister said in a newspaper interview on January 25 that the large

Icelandic trawlers will not be allowed to fish within the 12-mile fishery limit.

When Iceland extended its fishery limit to 12 miles, it excluded its own trawlers, although other Icelandic fishing vessels were allowed inside. The large trawlers lost some of their most important fishing banks because they were located inside the new limit.

A committee of the Alting (Iceland's legislature) recently adopted a resolution that would permit large trawlers to fish within the limit, but the resolution has met hard opposition and is expected to be defeated. ("Bör-sen," Jan. 27, 1967, and U. S. Embassy, Reykjavik, Feb. 2, 1967.)



West Germany

"METEOR" SAILS ON ATLANTIC OCEANOGRAPHIC CRUISE

The West German research vessel "Meteor" sailed from Hamburg, February 13, on an oceanographic expedition that is part of a broader UNESCO program. She carried 86 scientists, including specialists from Spain, Portugal, United Kingdom, and West Germany.

The Meteor will conduct 2 major investigations in the Atlantic between the Azores and the Canary Islands during the 6-month cruise. One study concerns the variability in physical and chemical characteristics of the ocean strata and currents. In particular, scientists will examine the effect of dense, high salinity Mediterranean Sea water as it enters the Atlantic.

The second major effort will be to explore the tops of certain underwater mountains, especially the Great Meteor Seamount, which rises from depths of 4,000 meters to within 300 meters of the ocean surface. The specialists will study animal life on this and other seamounts. (Some scientists believe underwater mountains are slowly sinking and that organisms are gradually being conveyed to deeper parts of the ocean.)

The research plan also includes a determination as to whether the sea bottom around the Canary Islands shows evidence of once having been part of the African land mass.

West Germany (Contd.):

Modern underwater TV cameras and drilling machines will be used. ("Vestkysten," Feb. 13, 1967.)



Spain

MAY PROCLAIM 12-MILE FISHING LIMIT

The Spanish Government is considering a law for a 12-mile fishing limit measured generally from the low-water mark along the coastline. However, provisions also are made to draw straight base lines between nautical points less than 24 miles apart. Further, provision is made to negotiate agreements with foreign governments whose fishermen claim traditional fishing rights off Spain.

Under the proposed law, Spain would gradually phase out foreign fishing in the 3-6 mile zone. Traditional foreign fishing in the 6-12 mile zone might be continued, at a level not exceeding the habitual catch, providing reciprocal rights were granted. (U. S. Consul Bilbao, Feb. 11, 1967.)



Italy

CANNED TUNA SALES ARE SLOW

According to the Italian Tuna Packers Association, domestic consumption and exports of canned tuna have declined in recent months. This was attributed to the difficulty of promoting sales in Italy because the rising cost of tuna since late 1966 has increased production costs of packers. The lifting of restrictions on meatless Fridays by the Roman Catholic Church also has contributed to the problem. To overcome depressed sales, the Association will try to hold down raw material costs and promote sales vigorously this year. ("Suisancho Nippo," Feb. 16, 1967.)

* * *

ENTERS OFFSHORE TUNA FISHERY

As more Italians accept frozen fish, and the demand for tuna products continues to rise, the industry is disturbed by the need for large imports. Most imported tuna comes from Japanese vessels fishing off west Africa. Now Italy has plunged into deep-

sea tuna fishing with the completion of her first 2 oceanic tuna vessels.

These 860-gross-ton vessels were built in Venice for the Societa Italiana Pesca Atlantica Tonno (SIPAT) and are named "Albacora" and "Albacora Secondo."

Overall length is 66.7 meters (219 feet), moulded breadth 10.6 meters (35 feet), and depth 5.24 meters (17.2 feet). The main power unit is a diesel of 1,300 hp., at 350 r.p.m., which drives directly a single propeller for a top speed of 14.5 knots. Fuel-oil tanks have a 388-ton capacity and freshwater tanks 62 tons. Each vessel can accommodate 24 persons.

The fish hold has a capacity of 750 cubic meters and is refrigerated to a temperature of -25° C. (-13° F.). A tunnel-freezer installation can freeze 15 metric tons of tuna a day. ("Fishing News International," Feb. 1967.)



United Kingdom

DIRECTORY OF FISHING VESSELS AND SUPPLIERS PUBLISHED

The "Fishing News Directory and Equipment Guide, 1967," recently published, is a comprehensive directory of British fishing vessels. It lists names and addresses of owners, equipment suppliers, fishery associations, and Government fishery authorities (administrative and research).

Also listed are vessels and owners for main ports, builders and their facilities, vessels recently completed, under construction, or on order.

The outfitters mentioned include suppliers of marine engines; propulsion, transmission, and steering gear; electronic equipment; and catching and hauling gear. Suppliers of marketing and processing equipment are included.

Associations are divided into those of vessel owners, catchers, fishermen, labor unions, processors, boatbuilders, insurance, and others. Its publisher: Arthur J. Heighway Publications, Ltd., Ludgate House, 110 Fleet Street, London EC4, England. Price £1 10s (US\$4.20) a copy.





Fig. 1 - "Tokei Maru," Japanese factory fishing vessel, processes king crab for food.



Fig. 2 - The deck of this Japanese vessel in the North Pacific is covered with bottom fish. (U. S. Coast Guard photographs)

ASIA

Japan

BECOMES BIG IMPORTER OF FISH

Japan, which thinks of itself as the world's leading fisheries nation, has become a large importer of fish.

In 1959, fish imports totaled only US\$7,700,000, but by 1966 had jumped to \$160 million--and this year are likely to hit \$200 million. The reasons: people are eating more fish and the domestic catch is leveling off.

Japan is the world's largest consumer of fish and consumption is rising steadily because of a rising standard of living. High meat prices also have stimulated fish buying.

Surveys show that farm households now eat as much fish as urban families. Western methods of cooking fish have made it more acceptable to younger people, who have been impressed in school with the need for more animal protein in their diet.

Imports Many Species from Near and Far

Controls on fish imports were lifted in 1961. The result has been a constantly growing inflow of shrimp, sea bream, tuna, her- ring, salmon roe, and cuttlefish, mostly frozen.

Heavy sellers in the Japanese market include neighbors like South Korea, the Soviet Union, and Taiwan, and more remote fisheries nations like Peru, Mexico, Spain, and Australia. The big Japanese fisheries companies also have become leading importers. Imports have been further stimulated by reciprocal deals, in which Japan sells vessels, equipment, and supplies technical aid in exchange for fish.

Meanwhile, Japan's own fish catches have leveled off sharply. Its total catch in 1965 was 6,880,000 tons--only 20,000 tons more than in 1962. Offshore fishing has declined markedly. ("Asahi," Feb. 3, 1967.)

PER-CAPITA CONSUMPTION OF FISH AND SHELLFISH ROSE IN 1965

Per capita fish and shellfish consumption in Japan in 1965 averaged 76 grams a day (about 2.6 ounces a day or 60.2 pounds a year), according to data of the Japanese Ministry of Agriculture and Forestry. This is a 4.5-percent increase over the 1960-64 average and 11.8-percent over 1964.

Year	Fish and Shellfish Consumption	Increase
	Grams ^{1/}	%
1965	76.0	-
1964	68.0	11.8
1960-64 avg.	72.3	4.5
1955-59 avg.	65.5	15.3

^{1/}One gram is equal to about 0.035 ounces.

This increase was attributed primarily to the record high fish landings in 1965 of 6.5 million metric tons. Per capita protein consumption in 1965 was 77.6 grams a day--53 grams (68.3 percent) from vegetable sources and 24.6 grams (31.7 percent) of animal protein. Fish constituted 12.6 grams (51.2 percent) of the animal protein. ("Nihon Suisan Shimbun," Feb. 8; "Suisancho Nippo," Feb. 6, 1967.)

WILL PROMOTE DOMESTIC EATING OF CANNED TUNA AND SALMON

The Japan National Canned Food Wholesalers Association plans to promote the sale of canned red salmon and canned lightmeat tuna packed in oil on the domestic market to make up for depressed canned red salmon exports to Great Britain and declining domestic sales of canned soy-sauce-seasoned tuna and saury. The Association will conduct the campaign with the Japan National Federation of Fishermen's Cooperative Associations (NIKKATSUREN). In 1966, NIKKATSUREN launched a drive to promote domestic consumption of canned whitemeat tuna in oil. ("Suisan Tsushin," Feb. 21, 1967, and other sources.)

Japan (Contd.):

FROZEN TUNA EXPORT
PRICES ARE DROPPING

As of early March 1967, good yellowfin catches by California tuna fishermen and the slowdown in canned tuna sales in the U.S. have depressed sales of Japanese frozen tuna to U. S. packers to the lowest level in recent years. The result is a sharp decline in Japanese frozen tuna export prices. The early February price offered by U. S. packers for gilled-and-gutted yellowfin for direct export was US\$430 a short ton c.i.f. Prices for direct albacore exports to the U.S. also are expected to decline below \$500 a ton c.i.f., heretofore maintained.

In the Atlantic, where most of the Japanese tuna fleet continues to concentrate on albacore, export prices are expected to weaken further. Current prices of Atlantic-caught albacore are not known because virtually no new sales to U. S. packers have been made since mid-January. Then, the price was \$440 a ton, f.o.b. Atlantic transshipment port. Prices may have fallen below \$420 a ton.

Japanese Watch Market Changes

In the Indian Ocean, Japanese vessel operators now fishing mainly for yellowfin are greatly concerned about recent market developments, especially dropping California yellowfin prices. The \$320 a ton recently offered by California packers for domestic yellowfin landings is comparable to the Japanese export price of \$410 a ton c.i.f. If the U. S. exvessel price drops to \$300 a ton, the Japanese export price may drop to below \$400 a ton. The Japanese also are concerned over growing tuna operations in the Indian Ocean by Formosa and other countries. They fear this may further disrupt prices.

Another problem facing the tuna industry is Italy's reduced tuna imports from Japan in recent months. Italy had provided a good market to which Japanese Atlantic and Indian Ocean-caught yellowfin could be diverted when U. S. market conditions were unfavorable. ("Suisan Tsushin," Feb. and Mar. 1967.)

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1966 SAURY PRODUCTION
WAS DISAPPOINTING

The 1966 Japanese saury production fell below expectations--landings of 237,800 metric tons worth 9,877,500,000 yen (about US\$27.4 million). This was an increase of 3 percent in quantity and 4 percent in value over 1965, but it failed to attain the 250,000-300,000 metric-ton level predicted for the season. Exvessel prices averaged 41.5 yen a kilogram (US\$104 a short ton). ("Nihon Suisan Shimbum," Feb. 8, 1967.)

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ADOPTS 1967 FROZEN TUNA
TRANSHIPMENT QUOTAS TO
ITALY AND U. S.

The Japanese Frozen Tuna Producers Association set new frozen tuna export quotas for business year 1967 (April 1967-March 1968). A quota of 44,000 metric tons was set for export to Italy, and 4,000 short tons for Indian Ocean transshipments to the U. S. The Italian quota is 14,000 tons over the duty-free quota of 30,000 metric tons established by the European Economic Community. The Indian Ocean transshipment quota for the U. S. is the same as BY 1966. ("Katsuo-maguro Tsushin," Feb. 17, 1967, and other sources.)

* * *

SET PLANS FOR 1967
NORTH PACIFIC TRAWLING

Tentative 1967 plans for Japanese trawling in the North Pacific were announced in mid-January. The fleets will total 14 with about 210 trawlers. Five fleets will fish all year and every company is planning on greater landings.

The Japanese trawl fisheries in the Bering Sea lost money after 1958--but recently, due to improved operations, they are beginning to make a profit. One feature of this year's plans is the increase in production of minced meat aboard motherships.

The extent of this fleet's operations in waters south of the Gulf of Alaska is not known yet. Apparently, the exploratory fishing last fall was not profitable, but the results are still being studied to see if the operations can be made more efficient.

Japan (Contd.):

For minced meat production, the fishing would focus on Alaska pollock found in the more northern waters of the North Pacific. (Fishery Attaché, U. S. Embassy, Tokyo, Feb. 3, 1967.)

* * *

FIRST ATTEMPT TO BUY MEXICAN FROZEN SHRIMP MEETS DIFFICULTY

The Japanese trading firm Mitsui Bussan recently contracted with a Mexican shrimp fishing firm to buy frozen shrimp for direct shipment to Japan. Heretofore, all Mexican shrimp exports to Japan were handled through a U. S. broker and shipped from Los Angeles or San Francisco. Mitsui Bussan could not obtain more than 30 of the 300 metric tons it had planned to buy for the initial shipment to Japan.

The firm faces considerable financial loss because it rented refrigerated space for 300 tons on the freighter scheduled to depart Mazatlan in late February. Despite this setback, the firm intends to continue this venture because, eventually, it may cut costs of shipping Mexican shrimp to Japan by 80 yen a kilogram (US\$0.099 a pound). ("Suisan Keizai Shim-bun," Feb. 27, 1967.)

* * *

WILL STUDY TERRITORIAL SEA LIMITS OF OTHER NATIONS

The Japanese Foreign Ministry plans to send Treaty Bureau Chief Fujisaki and Investigator Kawakami to South American, European, and South African countries on a 3-week trip to study the laws, treaties, and views of those nations on territorial sea limits and exclusive fishing zones. The two-man team, scheduled to depart February 22, plans to visit Mexico, Peru, Chile, Brazil, Argentina, Spain, Union of South Africa, and Kenya.

The Foreign Ministry reportedly hopes to use the team's findings to reexamine Japan's position on territorial sea limits and contiguous zones. At present, Japan and a few other nations adhere to the 3-mile concept--despite the growing trend among coastal states toward extending their territorial sea limits and exclusive fishing zones. ("Suisan Tsushin," Feb 21, 1967.)

* * *

ARGENTINA'S 200-MILE LIMIT WILL AFFECT JAPANESE FISHING

Argentina's recent decree extending her maritime jurisdiction to 200 nautical miles--and her sovereignty over the adjacent continental shelf up to the 200-meter isobar--is expected to affect Japanese trawl, tuna long-line, and whale fisheries. In particular, Japanese trawl operations aimed at developing the abundant merluza (hake) resource off Argentina will be impaired considerably by this decree.

The Japanese Government is concerned over this development. It is reported to have lodged a strong protest with the Argentine Government claiming it cannot recognize Argentina's unilateral extension of territorial sea limits--and that the extension has no effect internationally. ("Suisan Keizai Shim-bun," Feb. 1, 1967.)

* * *

GOVERNMENT ASKED TO PREVENT S. KOREA FROM HIRING JAPANESE FISHERMEN

On January 31, eight organizations concerned with northern seas fisheries asked the Japanese Ministries of Agriculture-Forestry, Foreign, and Transportation to control legally the hiring of Japanese crewmen by Republic of Korea (ROK) fishing vessels. ROK, which is attempting to start salmon fishing operations in the northern seas, is recruiting Japanese instructors at Toyama and Nemuro.

The 8 organizations argued: (1) the ROK action violates the Japan-Soviet Fisheries Agreement and the Japan-U.S.-Canada Fisheries Agreement; (2) ROK fishing for salmon will disturb the fishery order; and (3) considering the condition of resources, the entry of a third power cannot be approved. ("Sankei," Tokyo, Feb. 1, 1967.)

* * *

BANS ITS FISHERMEN FROM FOREIGN SALMON VESSELS

On February 13, the Japanese Government partially revised the Fisheries Licensing and Control Ordinance to prohibit its nationals from salmon fishing aboard foreign vessels. The new ordinance, which also sets penalties for violators, will render it impossible for Japanese fishermen to work for the South

Japan (Contd.):

Korean fleet planning high-seas salmon operations in the North Pacific. Earlier, the Government used the Passport Law to curb their travel abroad.

As a result, South Korea's recruitment of Japanese salmon fishermen has virtually ended. However, a problem has arisen concerning cancellation of provisional employment contracts signed earlier by 22 Japanese. Three of the 22 have cancelled their contracts. But the remaining 19 have spent all the advance pay of 30,000-50,000 yen (US\$83-139) received from the South Korean fishing firm and are having trouble returning the money.

The Korean firm reportedly plans to sue the 19 for nonperformance if they fail to pay. Meanwhile, the Seasonal Fishermen's Union in Toyama Prefecture (Japan Sea coast), to which the fishermen belong, is seeking Government help to solve this problem. The union claims the new ordinance infringes on human rights. It is considering a civil suit against the Government if the distressed fishermen are not helped. ("Minato Shimbun," Feb. 16, 1967.)

* * *

STUDY TUNA BASE ON WESTERN SAMOA

The Japanese fishing firms now supplying tuna to American Samoa are considering establishment of a tuna base at Apia, capital of Western Samoa, which became independent in 1962. The firms are Taiyo Gyogyo, Nichiro Gyogyo, and Nippon Reizo. They face growing difficulty in negotiating tuna prices for deliveries to American Samoa because U. S. packers there are relying more heavily on landings by Formosan and South Korean vessels.

The Japanese firms believe that a base at Western Samoa would be more advantageous even if prices for tuna delivered there were 10 percent below American Samoa's because they would not face the problem of tuna rejects. Two possible uses of the bases are being considered--cold-storage and tuna-packing operations. If a tuna base is set up, its primary use will likely be as a cold-storage point for tuna exports to Hawaii and mainland U. S. The Government of Western

Samoa is reported interested. ("Suisan Keizai Shimbun," Feb. 16, 1967.)

* * *

RESEARCHERS SEE POTENTIAL USE FOR FUR SEAL CARCASSES

Researchers at Keio University in Tokyo reported finding amino acids (polypeptides) in fur seal muscle. These acids are said to have a beneficial effect on high blood pressure, and in promoting skin smoothness by dilating surface blood vessels. Their report has caused Japanese firms to be interested in buying seal carcasses from St George Island in the Pribilofs.

* * * *

PRICE AGREEMENT REACHED FOR INDIAN OCEAN TUNA

The Japanese Overseas Fishery Company, which operates the tuna bases at Penang, Malaysia, and Port Louis, Mauritius Island, in the Indian Ocean, reached a price agreement with vessel owners for February landings there. The prices for large albacore and yellowfin represent a 10-yen a kilogram (US\$25 a short ton) decrease from December 1966-January 1967 prices.

February 1967 Tuna Delivery Prices for Penang, Malaysia, and Port Louis, Mauritius Island				
Species	Penang		Port Louis	
	Yen/Kg.	US\$/Short Ton	Yen/Kg.	US\$/Short Ton
Albacore, round:				
Lge. (over 24 lbs.)	172	434	152	383
Sml. (under 24 lbs.)	117	295	102	257
Yellowfin, gilled & gutted:				
Lge. (over 117 lbs.)	160	402	145	365
Sml. & med. (23-117 lbs.)	155	391	135	340
Big-eyed, gilled & gutted:				
Over 64 lbs.	105	264	95	239
23-64 lbs.	80	202	70	176
Bluefin, gilled & gutted	75	189	60	151

Tuna fishing in the Indian Ocean is reported slow. Catches average 2-3 metric tons a vessel per fishing day. ("Katsuo-maguro Tsushin," Feb. 8, 1967.)



Republic of Korea

INTERESTED IN NORWEGIAN VESSELS

A 3-man Norwegian delegation recently returned from South Korea after studying the pos-

Republic of Korea (Contd.):

sibilities of selling Norwegian-built trawlers, tuna boats, and marine equipment. Negotiations are continuing and prospects of Norwegian sales in excess of 100 million kroner (US\$14 million) are excellent. ("Fiskaren," Jan. 25, 1967.)



Taiwan

TAIWAN AND SOUTH KOREA PLAN TUNA FLEET EXPANSION IN AMERICAN SAMOA

According to information received by Japanese trading firms, Formosa (Taiwan) and South Korea plan to expand their Samoan-based tuna operations this year. Formosa reportedly plans to add 100 vessels and South Korea 10 to their Samoan fleets. If these plans materialize, Formosa will have by

year's end 168 tuna vessels operating out of Samoa, and South Korea 68 vessels.

Japan's tuna fleet based on that island in late December 1966 numbered 25 vessels. Its landings accounted for only 23.6 percent of Samoan tuna landings. ("Suisan Keizai Shimbun," Feb. 16, 1967.)

* * *

EXPORTS ALGAE PRODUCTS TO JAPAN

A factory for processing green algae (chlorella) into edible products has been set up in Taiwan. Using green algae as raw material, the factory produces green algae powder and extracts for export to Japan. It also produces monthly 1.2 million pounds of green algae-soybean "milk" and "milk powder" for local consumption. Food products made from this seaweed are rich in protein and fat. The location or ownership of this plant were not given in "Taiwan Industrial Panorama," Vol. 5, No. 11 and 12, December 1966.



FISH-BREEDING IN JAPAN

It is recognized that few of the world's fishing grounds are able to withstand increased exploitation, and indeed that many are already overfished. It is interesting, therefore, to learn of one reaction of the Japanese, the world's leading fishing nation, to this situation from the following extract from the Japanese "Times."

"OSAKA--Thirteen prefectures along the Inland Sea coast have disclosed a joint fish-breeding project to combat the dearth of fishing resources. The program aims at preventing the decrease of expensive fish such as sea bream, cuttlefish, prawns, octopi, and swellfish due to sewage from coastal industrial areas, according to the announcement. The prefectures participating in the joint project, include Osaka, Hyogo, Hiroshima, Miyazaki, and Kochi. The announcement said fish are to be hatched at nurseries along the Inland Sea coast and be sent to each prefecture, where they are kept in fish reserves for a month before being released into the sea. Two nurseries are expected to be completed in Oita and Okayama prefectures besides the two existing ones in Kagawa and Ehime prefectures. The operation cost of the joint project is estimated at ¥6 million, which will be appropriated by participating prefectural governments." ("Scottish Fisheries Bulletin.")

Note: 363 yens equal US\$1.

SOUTH PACIFIC

Australia

RESTRICTS SHRIMP IMPORTS FROM INDIA

The "Financial Express," Bombay, India, reported on January 25, 1967, that quantities of Indian shrimp were being held up in Australian ports after strict import quality standards were imposed. This was causing heavy losses because the Indian shrimp are suitable only for the Australian market.

Indian shrimp imports to Australia consist mainly of cooked peeled whole shrimp bought mainly by Chinese restaurants. (U. S. Foreign Agriculture Service, Bombay, Jan. 25, 1967.)



New Zealand

PLANS JOINT FISHING VENTURE WITH JAPANESE

The Japanese fishing firm Tokushima Suisan and a New Zealand firm, the East Coast Fisheries Products Company, are planning a joint fishing venture in New Zealand. The proposed company would engage in sea bream

and tuna long-line fishing in the South Pacific. The president of the Japanese firm was scheduled to visit New Zealand in late April to conduct preliminary talks. ("Minato Shim-bun," Feb. 17, 1967.)



Fiji Islands

FISHING INDUSTRY IS GROWING

Since 1963, the Pacific Fishing Company Ltd., predominantly Japanese controlled, has been operating in the Fiji Islands from a freezing and storage base at Levuka on Ovalau Island. The company has concentrated on catching, freezing, and exporting tuna--mainly to Japan and the United States.

Since its establishment, the company has operated under special legislation exempting it from income and export taxes. Legislation also barred any competitive operation in the Colony. The Government of Fiji is reviewing this status because it wants to encourage investment from outside and to diversify industry. (U. S. Consul, Suva, Feb. 3, 1967.)



RARE SPECIES OF WHALE SAVED BY SKINDIVERS

On the New South Wales coast, skindivers drove a mother whale and her calf out of Sydney Harbor--and so may have saved the last of a rare species known as the "Southern Right." The name "Southern Right" originated during the 1800s because this species was considered the "right whale" to catch. Dr. W. H. Dawbin of Sydney University identified the species from underwater photographs taken by the skindivers.

The Southern Right whale was the foundation of the Australian and Antarctic whaling industry in the 1800s and they were slaughtered by the thousands. In the Antarctic, 200,000 were killed by American whalers alone. By 1900, the herds had been decimated, and the Australian whalers had to turn to the sperm whale in eastern states and the humpback in Western Australia. In 1929, the Australian State Governments decided to put the species under total protection because sightings of the Southern Right whale were almost nonexistent. This delayed step to save the species was followed by other governments throughout the world. However, protection did not produce new herds and the species seemed doomed. ("Science News.")

AFRICA

Ghana

JAPANESE RESUME TECHNICAL AID

Japanese training of Ghanaian vessel crews in trawl operations has been resumed after a year of negotiations between Nihon Suisan and the Ghanaian Government Fishery Corporation. Nihon Suisan concluded its first technical cooperation agreement with Ghana in 1964. Recently it agreed to provide 25 Japanese nationals to man the 1,980-ton trawler built in domestic shipyard for Ghana. The vessel was scheduled to depart on February 4, pick up 30 local trainees, and conduct trawling off Angola. Four more 1,900-gross ton Japanese trawlers are reported scheduled for delivery to Ghana. ("Minato Shimbun," Jan. 31, 1967.)



Mauritania

EXTENDS ITS TERRITORIAL WATERS FURTHER

On February 13, the Government of the Islamic Republic of Mauritania (GIRM) extended its territorial waters to 12 nautical miles. It also increased greatly the waters claimed for its jurisdiction in which trawling will be permitted.

The new law, effective in mid-March, abrogates the previous GIRM claim to a modified 12-mile limit: a 6-mile limit of territorial waters, and fisheries jurisdiction in the 6-mile contiguous zone beyond. The territorial waters claimed are further increased by establishing a straight line from Cape Blanc to Cape Timiris as the base from which to calculate territorial jurisdiction. On the southern Mauritanian coast, the base reference point still is the low-tide mark.

Waters Opened to Trawlers

All of Mauritania's territorial waters, except the Bay of Levrier, now are opened to GIRM-authorized trawlers. Previously, the GIRM had permitted trawling only in the 6-mile zone over which it claimed fisheries jurisdiction. Trawling permission now may be granted on a boat-by-boat basis to vessels

of nations that conclude bilateral agreements with GIRM, or to Mauritanian-flag vessels. To qualify for Mauritanian registry, vessels must be manned by at least 50 percent Mauritanian nationals or "assimilees." An "assimilee" is a French national considered "Mauritanian" for purposes of GIRM nationality requirements by a special long-standing protocol between GIRM and France. (U. S. Embassy, Nouakchott, Feb. 21, 1967.)



South Africa

LIVE SPINY LOBSTER TRADE GROWS

A central marketing body has been set up to coordinate the activities of the 6 South African companies holding concessions to sell live spiny lobster in Europe. Eighty percent of the live lobster are sold in Paris and Nice. During the first 5 months of 1966, 139 tons worth about US\$425,000 were exported. The 1966 catch was limited because of adverse fishing conditions.

The export by air freight of 175 short tons of live spiny lobster to Europe in 1965 was a marked increase over the 1964 figure of 17½ tons, according to the Cape Lobster Exporters' Association.

In 1964, 1½ tons of whole fresh frozen lobster were exported; in 1965, 64 tons. Export of tails is worth about \$11,900,000 a year. ("South African Digest," Feb. 10, 1967.)



South-West Africa

PILCHARD QUOTAS REMAIN THE SAME

Pilchard quotas of 90,000 tons for each of the eight factories in Walvis Bay (South-West Africa) remain unchanged for the 1967 season.

At Walvis Bay and Luderitz, during October 1966, output of fish products was:

Fish meal (short tons)	3,524
Fish oil (gallons)	70,112
Canned fish (1,000 lbs.)	

South-West Africa (Contd.):

At Luderitz, during November 1966, production and exports of fish meal and canned spiny lobster were:

	Weight Lbs.	Value US\$
Fish meal	4,256,000	175,500
Canned spiny lobster	9,400	14,800
Total	4,265,400	190,300

The Fish Meal Picture

An interim report by the Oceana Group of fishing companies reveals that the overall return from fish meal sales in 1966 was considerably better than 1965's. In recent weeks, however, international markets have changed rapidly and 1967 returns will be lower. There was heavy production in Peru in second-half 1966; the year also was exceptionally productive for Scandinavia and Iceland.

The report also states that if consumption is to be boosted to a point where the world export surplus can be readily absorbed, prices should remain realistic. If the volume of production in South Africa and South-West Africa can be maintained, world fish meal trends would not be considered disturbing. ("Barclay's Trade Review," Johannesburg, January 1967.)



South Africa Republic

CONDUCTS FISHING TRAINING

A Cadet Course for young men who intend to take up commercial fishing in the inshore fishing industry as a career is being held for the first time at the South African Merchant Navy Academy at Granger Bay, Cape Town.

When they complete the course in November-December 1967, all candidates will be required to take examinations; the successful ones will win a "Diploma Certificate--Fishing Cadet." The Department of Transport will allow certain "sea time service" reductions in favor of such certificate holders so that later they can take examinations for mate and skipper certificates of competency.

Fees are about US\$540 for the full year, including board and lodging. The course started on Jan. 23, 1967.

The fishing cadets will be trained in elementary applied mathematics and physics, theory of navigation, practical and theoretical seamanship, practical navigation, ship construction and stability, and electronic equipment. Also, they will study elements of engineering and refrigeration, radiotelephone procedure, marine biology, history of the fishing industry, and fish preservation. ("Namib Times," Walvis Bay, Dec. 23, 1966.)



Kenya

ISSUES LICENSE REGULATIONS FOR SHELLFISH BUSINESS

The Government of Kenya issued, December 20, 1966, the Fish Protection (Crustacea) Rules 1966, which bring under license the selling, marketing, and processing of crustacea, including all species of shrimp, prawn, lobster, crawfish, and crab.

The intent of the rules is to give the Kenya Inshore Fisheries Limited, formed in June 1966, a trading monopoly in these products. The firm has equity participation from the Government, a British firm, and local businessmen.

In 1965, the exports of fresh crustacea amounted to 15,700 pounds worth about US\$10,000. Those exports will grow considerably during 1967 because the firm has all the facilities to process and export them. (U. S. Embassy, Nairobi, Feb. 3, 1967.)



Zanzibar

STUDENTS COMPLETE FISHERIES TRAINING IN EAST GERMANY

About 20 of the 70 fisheries trainees Zanzibar sent to East Germany in 1965 for training have returned home. They studied ship engineering, ship handling and other aspects of seamanship. They plan to continue their studies and to teach their new skills to other

Zanzibar (Contd.):

students. Only 10 of the 70 were awarded "certificates" for completing the course. Other students, only partially trained, are being returned to Zanzibar to go to work in the fishing industry and continue their studies concurrently.

Two fishing vessels are on the way to Zanzibar. "Teachers" from East Germany are accompanying the students and will carry on their work until the students can do their jobs unassisted. The teachers also will carry out further investigations into the local fishing industry and the canning of fish. (U.S. Consul, Zanzibar, Feb. 21, 1967.)



Spanish Sahara

FRENCH FISH FOR SPINY LOBSTER

The Brittany coast and the Bay of Biscay down to the Spanish border long have been excellent French fishing grounds. But the demand for certain fish sometimes exceeds supply and compels fishermen to travel further.

One very specialized operation is fishing for the Green Mauritanian spiny lobster (*Palinurus regius*). This crustacean differs from the ordinary English variety, known as "Red" lobster in France. It is caught mainly in shallow water off Spanish Sahara, in 12 to 18 ft., along a small stretch of coast called "Rio de Oro," near St. Etienne. Catching and bringing them back alive was first devised by Breton fishermen. Now that it belongs to Spain, Spanish authorities make some attempt to control fishing. Their first move was to restrict fishing to March 1-August 31. Foreign fishermen may be excluded altogether in the near future.

Special Vessels Used

Vessels built in Douarnenez and Camaret were designed to spend up to 6 months at sea, store catches in open holds, and so bring them back alive.

Of 30 small vessels now operating, the 240-ton "Ar Bec" is typical. Built 10 years ago of timber, the hold contains 200 cu. m. of sea water and can take 20 tons of lobster. She is not meant for speed. In heavy weather, she slows down because the pressure of wa-

ter entering and leaving hundreds of slits and holes, when she rises and falls, can damage the fragile cargo. The Danish 240-hp. diesel normally drives her along at 7 knots. Considering her length of 90 ft., 25-ft. beam, and 13-ft. draught, this is reasonably good.

The hold's interior is protected with an inch-thick coating of cement, reinforced by steel rods laid over the Iroko planking. Usually, this lasts up to 10 years before requiring inspection and replacement. On being slipped, straw is burned in the hold to kill various growths and parasites.

The vessel has a working life of 25 years, depending on upkeep. Sometimes, this is complicated by a traditional system of having up to 100 shareholders. Disagreements occur, especially after a poor catch. The crew of 11 men and a boy work on a shareout basis. Usually, 52 percent goes to the vessel; 48 to the crew--the skipper has $2\frac{1}{2}$ shares to any of the crew's one.

How They Fish

The "Mother" ship first is based in a safe anchorage. Then, using two 25-ft. sea-going launches with 18-hp. diesels, the men go out to set their nets. Each man lays 30 at a time. The nylon nets are about $3\frac{1}{2}$ ft. wide. One side is kept on the bottom by lead weights; the other is kept upright by a string of small floats.

Because this is done near rocks, there is much damage to nets. Every morning, each man picks up his 30 nets and lays down another 30. Then, he returns to vessel, untangles spiny lobsters, each weighing $\frac{3}{4}$ to $1\frac{1}{2}$ pounds, and repairs damage for next morning's work. About 140 nets are allocated to each man per voyage. The hold, subdivided into 5 sections, is inspected by using an "Aqualung" to remove any dead lobster.

Back in port, a large nylon tarpaulin is laid under and around the hull, while large capacity pumps remove the water so the lobsters can be unloaded.

Conditions on board are good. Hours are, as the captain aptly put it, "100 percent." Average earnings are about £1,200 (US\$3,400) a year, with a month off after each voyage. But it's a life of swiftly changing fortunes. The cargo has to be sold on arrival because the chances of fatalities, which cannot be sold, increase for every day in port. A 25 percent drop in price is not unusual from one day to the next. ("Fishing News International," Feb. 1967.)



ARTICLES

THE SUN-DRIED-SHRIMP INDUSTRY OF MEXICO'S NORTH CENTRAL GULF

By Travis D. Love*

Sun-dried salted shrimp are little known to the U.S.A. outside New Orleans and Cameron, La. Much of the production is exported to the Orient. In 1965, production in the Louisiana area was 275,000 pounds; 407,000 pounds were imported from Nicaragua and other Central American countries, presumably for reexport to the Orient. Thus, sun-dried salted shrimp are a sizable segment of shrimp products produced in the Americas.

Chinese immigrants started the industry around 1880. Two large expansions occurred—one in 1908, resulting from better marketing; another in the 1920s, when the otter trawl and gasoline-powered craft were introduced. Processing equipment and methods are simple but effective. BCF statistics show that industry production rose to 4 million pounds in 1935. Production declined in recent years because of increased canning and freezing operations.

The Pascagoula Technology Laboratory of the BCF was asked for information on a production process for sun-dried shrimp that might be useful in the A.I.D. assistance program for underdeveloped countries.

HISTORICAL

The sun-dried-shrimp industry began in Louisiana just after the Civil War.^{1/} In 1880, land patents were given to Chinese immigrants living on several islands in Barataria Bay. The Chinese reportedly lived on these islands prior to 1880 and sun dried shrimp. On January 13, 1885, the U. S. Patent Office issued Patent Number 310-811 to Yee Foo for a process to sun dry shrimp. Actually, the Chinese have used this method for preserving shrimp and other animal foods for centuries.

*Laboratory Director, BCF Technological Laboratory, Pascagoula, Miss.

^{1/}Part of this section was obtained from an article in the "Houma Courier" of Houma, La., August 12, 1966, which credited Emile LaPeyere and Leopold Blum.

Bob Collins Sr., one of the oldest living fishermen on Grand Isle, states that the earliest drying platforms were at Manila Village, Bassa Bassa, and Bayou Brouilleau. Later, Filipinos arrived and assisted the Chinese in catching and drying shrimp. The first man to dry shrimp on a large scale was Ting-Ting. The Fisher family of Lafitte was one of the first native producers. Their platforms in Terrebonne Parish were operated by Chinese managers.

Industry Spurred After 1906

Until 1906, sun-dried shrimp had either been exported to the Orient or consumed locally. There were no other means of preserving shrimp in those remote areas. In 1906, a grocery dealer, Leopold Blum, bartered for and distributed dried shrimp. He formed a partnership with Shelley Bergereon to trade in dried shrimp, raw furs, and farm produce. Several other local firms were formed. During the next 20 years, there was a tremendous increase in the production of dried shrimp.

In the early 1920s, beach seines for catching shrimp gave way to the otter trawl. Used auto motors provided a cheap source of power for the small shallow-draft craft. In 1922, Fred Chauvin and Shelley Bergereon were awarded a patent for a rotating-drum shell remover for dried shrimp. Another large production increase followed until, in 1935, the peak of 4 million pounds was reached. Since a 210-pound barrel of raw shrimp yields only 26 to 30 pounds of dried shrimp (13-14 percent), this peak production represented about 30 million pounds of raw whole shrimp.

During the early 1930s, the canning plants and fresh iced-shrimp trade began taking

more of the more desirable larger shrimp. So the dried-shrimp industry began to use smaller shrimp and seabobs, both difficult to peel by hand while raw. In 1948, the Peeler's machine was invented--which could easily peel very small shrimp for canning, and the price of small shrimp and seabobs increased tremendously. The introduction of chemicals to control "blackening" in canned seabobs increased the price of seabobs.

Leopold Blum, still active, reports that his firm handled about 250,000 pounds of dried shrimp in 1965, and that the heavy use of small shrimp for canning and breeding has forced up the wholesale price of dried shrimp to \$2.50 per pound. There are 15 to 20 drying platforms operating intermittently. About 300 small butterfly-net skiffs deliver small shrimp and seabobs to these drying platforms when the price is lower. At times, these small skiffs catch larger shrimp and deliver them to other markets at a higher price.

BOATS AND GEAR

Shrimp for sun drying were caught by hand-pulled beach seines and casting nets until the early 1930s. At this time, the otter trawls and the gasoline-powered craft (fig. 1) made possible a great increase in the shrimp catch per fisherman. As boats increased in power, they ranged farther into the Gulf for shrimp (fig. 2). Some present-day Florida-type trawlers have diesel motors up to 300 hp. and pull two large trawls (fig. 3).

The "butterfly" net was invented to meet the present-day necessity for smaller and

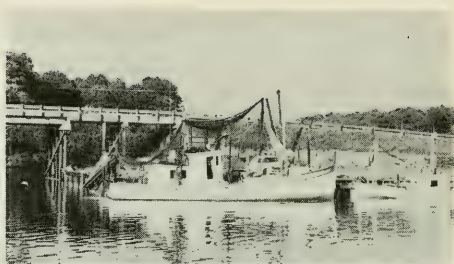


Fig. 2 - Single-rigged Biloxi-type trawler.



Fig. 3 - Double-rigged Florida-type trawler.

cheaper shrimp in the sun-drying industry. It is square, about 10 by 12 feet, made of iron pipe fitted to a small-mesh bag about 15 feet long. Wing nets extend the width as needed to trawl from shore-to-shore in small bayous. These butterfly nets (fig. 4) are

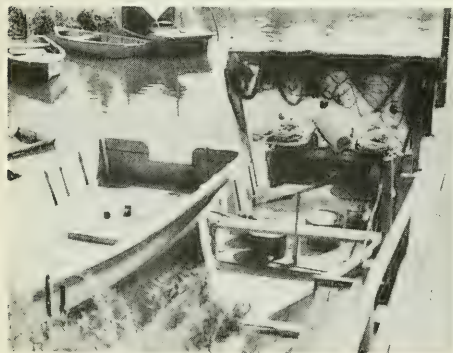


Fig. 1 - Lafitte skiff and otter trawl.



Fig. 4 - Lafitte skiff and butterfly nets.

trawled at night by 18- to 25-foot Lafitte skiffs powered by used V-8 engines. With the introduction of the large double-rigged Florida trawlers, many of these fishermen built larger skiffs and pulled double-rigged butterfly nets (fig. 5). These butterfly nets are so efficient that they are replacing otter trawls on the smaller Biloxi-type trawler in this area (fig. 6).



Fig. 5 - Lafitte skiff and double-rigged butterfly nets.



Fig. 6 - Biloxi-type trawler and butterfly nets.

PROCESSING METHODS AND EQUIPMENT

Processing methods and equipment have changed very little since the inception of shrimp drying. Whole raw shrimp are cooked in saturated salt water for 30 minutes. The cooker consists of a steel-mesh hinged basket, which lowers into a steel tank (fig. 7). The cooked shrimp are carried in wheelbarrows to a crude wooden platform and distributed in a thin layer on its surface (fig. 8); 2 to 3 days of hot dry weather are required to

sundry the shrimp. Properly dried and handled, they have a shelf life of up to 1 year. It is necessary to sweep the shrimp into piles and cover them with tarpaulins at night as a protection from the heavy coastal dew-fall (fig. 9). The shrimp, while drying, must be protected in the same manner from rainfall.

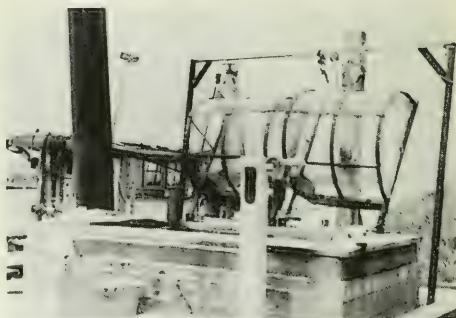


Fig. 7 - Cooking tank and basket.



Fig. 8 - Wooden drying platform.



Fig. 9 - Wooden drying platform with covering tarpaulin.

After the shrimp are properly dried, the shells must be removed. For small amounts, the shrimp may be flailed with a bundle of branches or a large homemade "flyswatter". The loose hulls are removed by sifting or winnowing. These methods consist of either shaking the shrimp on hardware cloth or pouring them from a height during a brisk wind. A mechanical shell remover has been patented. It consists of a 4 by 10 foot cylindrical drum of hardware cloth rotated by a motor. Angle-iron flanges inside the drum

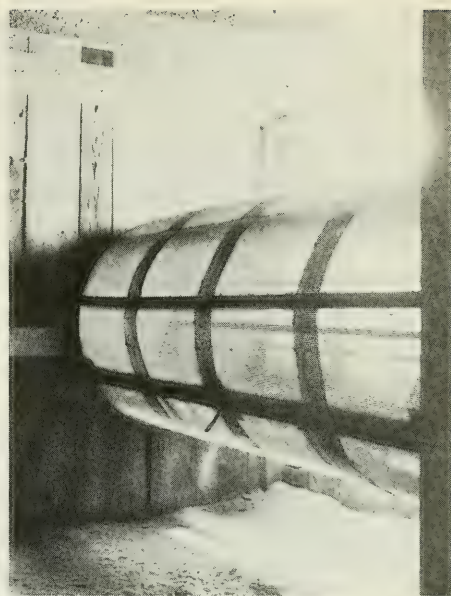
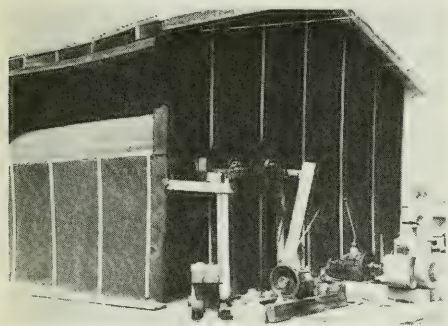


Fig. 10a and b - Mechanical shell remover.

toss the shrimp and cause their hulls to break off (fig. 10). A small amount of shell retained with the shrimp is acceptable in the industry.

Some sun-dried salted shrimp is hand cleaned of shell for use as hors d'oeuvres. Usually, it is packaged in small polyethylene bags and distributed to bars and taverns.

CHEMICAL COMPOSITION

A 210-pound barrel of small shrimp will yield 26 to 30 pounds of sun-dried salt shrimp. Recipes developed by the firm of Bergereon and Blum of Houma, Louisiana, require the reconstitution of the dried product in warm water prior to use in a shrimp dish. Considerable loss of protein is known to occur in small shrimp from cooking and from loss of drip prior to cooking. The composition values (table) reported are given for the

Proximate Composition of Dried Shrimp (Average of 2 Analyses)				
Lot	Protein ^{1/}	Oil	Ash	Moisture
	(Percent)			
1	65.1	3.7	19.5	9.7
2	55.8	2.7	19.5	9.7
3	66.9	2.0	19.5	10.0

^{1/}Extreme variations in protein may be due to presence of varying amounts of chitin from shell left on the shrimp.

commercial-dried product as taken from burlap bags in the warehouse. 100-gram portions were taken as samples from three lots in the warehouse; composition values are from duplicate analyses on each lot. Protein values are estimated from micro-Kjeldahl determinations for nitrogen X 6.25 (Association of Official Agricultural Chemists, 1965, "Official Methods of Analysis," 10th edition, Sec. 38.011; oil was determined as in Sec. 18.012; ash as in Sec. 29.012; and moisture as in Sec. 22.008).



DISTRIBUTION OF SOUTHERN QUAHOGS OFF THE MIDDLE ATLANTIC COAST

By Arthur S. Merrill and John W. Ropes*

The southern quahog, *Mercenaria campechiensis* (Gmelin), is a large, common bivalve whose major distribution is confined to the southern half of the east coast of the United States and the Gulf of Mexico. Little is known about its distribution north of Cape Hatteras, N. C. Johnson (1934) listed the range to Virginia; Abbott (1954) defined the northern limit more explicitly as "Chesapeake Bay." Recent findings allow us to show the distribution of the species in the middle Atlantic waters, and to extend the range northward to Point Pleasant, N. J.

The hydraulic dredge, developed and used by the industry to catch surf clams living within the substrate (Merrill and Webster, 1964) proves to be an excellent collector of southern quahogs, which also live within the substrate. Thus, during surf clam research cruises, we were able to record the occurrence of southern quahogs and other species taken by the dredge.

3 Vessels Made 4 Cruises

During 1965 and 1966, the BCF research vessels "Undaunted," "Delaware," and "Albatross IV" made 4 major surf clam cruises in offshore waters from Long Island, N. Y., to Cape Hatteras, in depths to 60 meters. The dredge travelled over about 1,000 square feet of bottom during each 5-minute tow. The southern quahog was taken at 42 of 1,279 stations. In addition, 2 collections were made by staff members while on 1-day trips aboard commercial surf clam vessels. Figure shows the locations where quahogs were caught and lists pertinent data.

We are not aware of any published information on the distribution of southern quahogs in offshore waters of the middle Atlantic bight. In fact, we find no record of the species in offshore waters north of Chesapeake Bay.

We are confident of our identification of the specimens as southern quahogs. Our clams

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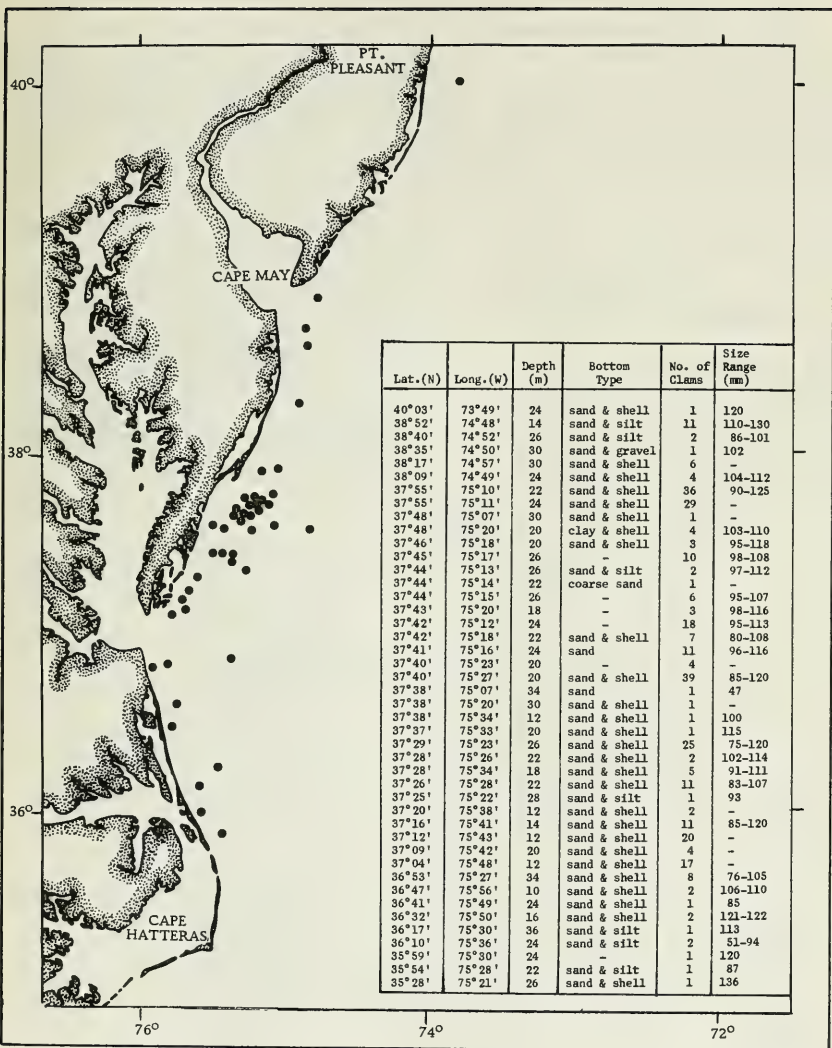
have the dominant shell characters attributed to *M. campechiensis*. The shell is ponderous, inflated, and has a rounded lunule; the surface structure has the dense, concentric lamellations characteristic of the species; and the internal surface is white, lacking a purple border. Collections from several of our stations have been deposited in the Mollusk Department of the Philadelphia Academy of Natural Sciences.

Most of Southern Quahogs Were Large

Most of the southern quahogs collected were large—principally because the hydraulic dredge is selective. The dredge is rigged to retain commercial-size surf clams and to allow small specimens and other material to pass through the mesh linkage. The shell length of the 1 to 39 quahogs caught per tow ranged from 47 to 136 mm. (average 102 mm.). They were taken in water depths of 10 to 36 m. (average 23 m.). The bottom type was usually sand and shell, but at seven stations silt or clay was plentiful along with the sand.

Quahogs were larger and more numerous in sand and shell substrates (average shell length, 105 mm.; average catch per tow, 9.2) than in sand and silt (97 mm.; 2.8 per tow). Pratt (1953) observed faster growth in northern quahogs (*Mercenaria mercenaria*) living in sandy substrates than in sand and mud mixtures.

Southern quahogs were taken from Point Pleasant, N. J., southward to Oregon Point, N. C. (fig.) and were most numerous in offshore waters southeast of Chincoteague Inlet, Va. Our most northern record for *M. campechiensis* is off Point Pleasant, N. J., at 40°03' north latitude. A single specimen, 120 mm. long, was taken by a commercial surf clam vessel. The rarity of the southern quahog at this northern locality is indicated by the capture of the single specimen during a 6½-hour period of fishing (34 tows) in which 240 bushels of surf clams were boarded.



Hard-clam occurrence off the middle Atlantic coast. Dots indicate where clams were taken. Table insert lists station information.

Fossil records indicate that the southern quahog once may have lived much farther north. Morse (1920), who reported on fossil shells in the boulder clay of the Boston Basin, found thick fragments in the various deposits he believed were *M. campechiensis*.

Our findings complement the recent report on the distribution of hard clams off the southeastern United States by Cummins (1966). The results from exploratory dredging provide

records from Florida to North Carolina. A small fishery for southern quahogs in offshore North Carolina was reported earlier by Porter and Chestnut (1962).

The concentrated population of clams southeast of Chincoteague Inlet may be sufficient to support exploitation. Further assessment seems necessary to determine if the bed is dense enough to warrant a small fishery.

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ERRATA

In the March 1967 CFR--"An Aircraft and Vessel Survey of Surface Tuna Schools in the Lesser Antilles," by Albert C. Jones and Paul N. Sund--page 43, col. 2, line 9 reads: "Skipjack tuna were most abundant in schools estimated at 15 to several hundred tons each."

It should read: "Skipjack tuna, in schools estimated at 15 to several hundred tons each, were most abundant."

Page 44, col. 2, lines 42-48: The ratios comparing the searching efficiency of the plane and vessel were printed 2:2, 2:4, 2:4, 9:6, and 1:1.

The ratios are: 2.2, 2.4, 2.4, 9.6, and 1.1.

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A CLAM MEASURING BOARD

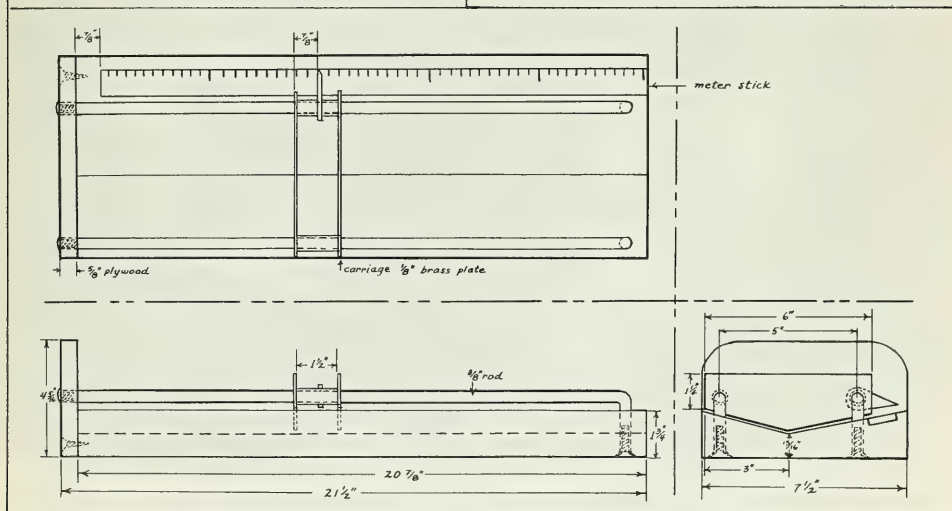
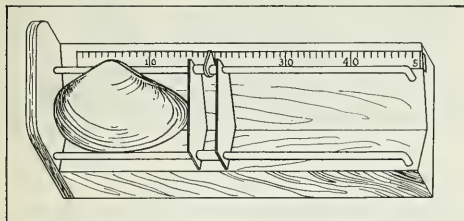
By Phillip S. Parker*

In spring 1964, a clam measuring board (fig.) was developed at the BCF Exploratory Fishing and Gear Research Base, Gloucester, Mass. A different type of board was needed to make rapid and accurate measurements of surf clams (*Spisula solidissima*) aboard vessels at sea because the boards available were generally unsuited for this type of work. With the new board, we were able to make clam measurements rapidly and accurately even under rough sea conditions. Considerable savings in time and effort were effected.

This measuring board can be built by almost anyone handy with tools (see List of Materials and fig.). The entire board (excluding metal parts) is covered with polyester resin to reduce wear and wood deterioration from the action of sand and salt water during use. A light application of grease on the rails is necessary for smooth action of the carriage; the only other maintenance required is to replace the meter stick after the markings become unreadable.

The Materials Needed

1. One piece of $\frac{5}{8}$ " plywood, $4\frac{5}{16}$ " x $7\frac{1}{2}$ ", for the end plate.
2. One piece of 2"x8"x21" clear white pine beveled for the bed of the measuring board.
3. One meter stick recessed and secured by small finish nails into the top of the board,



Sketch of measuring board used during surf clam surveys aboard the BCF research vessel "Delaware".

*Fishery Biologist, Exploratory Fishing and Gear Research Base, BCF, Gloucester, Mass.
Note: This is Equipment Note No. 20.

and offset from the end plate, so the pointer is at zero when the carriage is against the end plate. (Note: the pointer should not scrape the surface of the meter stick.)

4. Two stainless-steel rods, $\frac{3}{8}$ " x 24", for carriage rails.

5. One small flat piece of brass plate, $\frac{1}{8}$ " x 1" x 2", for pointer, which is brazed to a carriage bushing.

6. Two brass plates, $\frac{1}{8}$ " x 2" x 6", plus two $\frac{1}{2}$ " outside diameter $1\frac{1}{2}$ " brass bushings for the

sliding carriage. The plates are brazed to the bushings. The carriage is slid along the rails and the pointer indicates the measurement of the clam on the board.

7. Two $\frac{3}{16}$ " x $\frac{3}{4}$ " flat head bolts and two $\frac{3}{16}$ " x $\frac{3}{4}$ " round head bolts for securing the rails to the bed and end plate.

8. Two $\frac{3}{16}$ " x $1\frac{1}{2}$ " flat head screws for attaching and securing end plate to bed of measurement board.



OYSTERS STILL A FAVORITE DISH

Oysters were a favorite dish of early American settlers who are reported to have learned about the delicacy by watching Indians eating roasted oysters. Oysters are still a favorite dish of many persons in the United States, says the Department of the Interior's BCF.

Oysters are found along this country's coastlines from Massachusetts to Texas and from Washington to Mexico.

The idea that oysters should be eaten only in months containing the letter "R" is simply not true. Actually these succulent mollusks are at their best in May and June on the Atlantic Coast, even though some states prohibit their harvest from public grounds during spring and summer.

"They should be included in meal planning because of their flavor and nutritional value," said H. E. Crowther, acting director of the Bureau. He emphasized that oysters are an excellent source of protein, minerals, and vitamins.

Oysters can be served raw on the half shell or in stews or chowders. They may be baked, broiled, fried, creamed, or scalloped.

The following oyster stew recipe has been developed by BCF home economists.

OYSTER STEW

1 pint oysters	$\frac{1}{2}$ teaspoons salt
4 tablespoons butter	$\frac{1}{8}$ teaspoon pepper
1 quart milk	Paprika

Melt butter, add drained oysters and cook 3 minutes or until edges curl. Add milk, salt, and pepper, and bring almost to boiling point. Serve at once. Garnish with paprika. Serves 6.

Further suggestions on the selection and preparation of oysters can be obtained by writing for the recipe booklet, "How to Cook Oysters." It is available for 20 cents from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.



SLEEVE FOR CLAM JETTING HOSE CONNECTION

By Phillip S. Parker*

This is the second in a series of gear notes describing specific units or pieces of gear used by the BCF Exploratory Fishing and Gear Research Base, Gloucester, Mass., during exploratory sea clam surveys along the Middle Atlantic seacoast. The piece of gear described is a steel sleeve (fig. 1) similar to those used throughout the commercial sea clam industry to connect two sections of clam jetting hose.

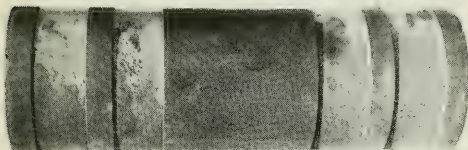


Fig. 1 - Eighteen-inch steel sleeve used for connecting clam jetting hose aboard the Delaware.

2 inches wide and $\frac{1}{16}$ inch deep cut into the steel tubing with 1-inch spacings. The sleeve is 18 inches by 6-inch outside diameter, which allows it to slip easily into the 6-inch inside diameter end of the clam jetting hose. The hose is compressed into the depressions by clamps placed on the outside of the hose over these cuts (fig. 2). The main advantages of this arrangement of hose connection are that the union is more secure, and lengths of hose can be added or taken off with comparative ease in less time than disconnecting the beveled sleeves. With beveled sleeves, the jetting hose is compressed with steel bands, which generally have to be discarded.

To further strengthen the holding capacity of the clamps, a short section of chain is connected between the two inside clamps to keep them from pulling apart. With this arrange-

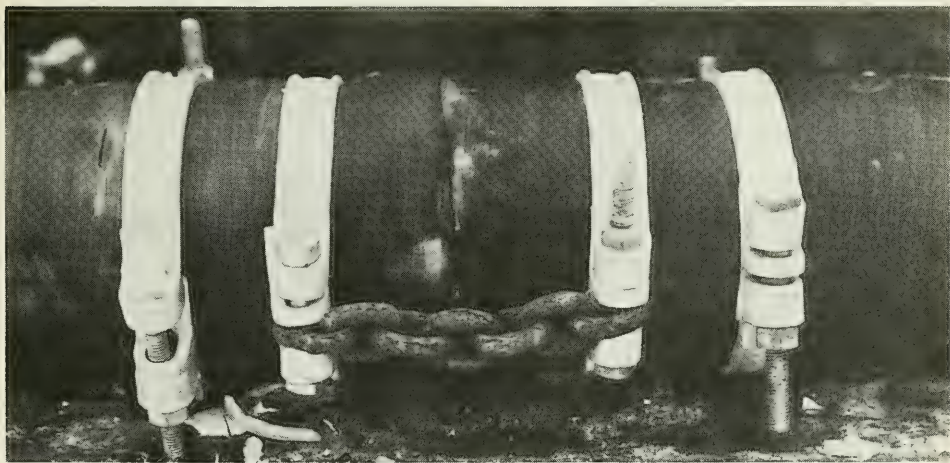


Fig. 2 - Clamp arrangement over two sections of clam jetting hose.

Whereas sleeves used by commercial fishermen are beveled from the center to each end, the sleeve used aboard the M/V "Delaware" for sea clamming has four depressions

ment, we have had no trouble with the hoses parting at the union even at pressures of above 175 pounds per square inch.

*Fishery Biologist, Exploratory Fishing and Gear Research Base, BCF, Gloucester, Mass.
Note: This is Equipment Note No. 21.

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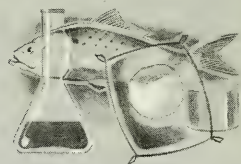


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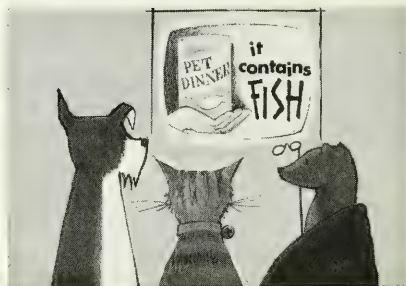
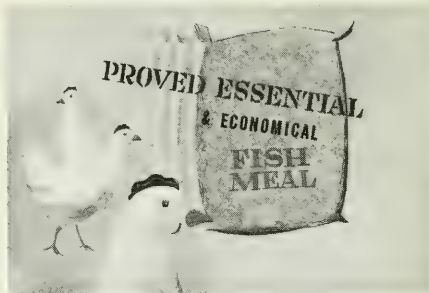
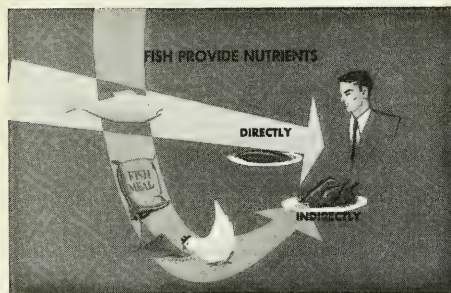
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OC. PERCH	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SALMON	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MULLET	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HALIBUT	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TUNA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SHRIMP	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
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COVER: Seated on trawler rail in Gloucester, Mass., port, veteran fisherman mends his gear. (Photo: USN, National Archives)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.



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Captain of gill netter checks his catch--mostly cod.

(Photo: USIA/National Archives)

PRESIDENT ISSUES FIRST REPORT ON MARINE SCIENCE AFFAIRS

President Johnson has issued the first report to the Congress on marine resources and engineering development. Entitled "Marine Science Affairs--A Year of Transition," it is the work of the National Council on Marine Resources and Engineering Development, chaired by Vice President Humphrey.

The Council, created in 1966, advises and assists the President in planning policy and coordinating the marine science programs of 11 Federal agencies.

The President states that the oceans' resources can help meet many of the challenges facing the Nation and the world. He emphasizes these points:

- "The vast food reserves of the sea must be developed to help end the tragic cycle of famine and despair."
- To safeguard human health and protect the sea's resources, we must stop, and then undo, the continuing pollution and erosion of seashores, bays, estuaries, and the Great Lakes.
- We must understand better the influence of oceans on the environment "to improve

long-term forecasting of storms, weather, and sea conditions; protect life and property in coastal areas; and improve the prediction of rainfall in the interior."

• We must take the wealth of the ocean floor to benefit mankind.

• "Finally, the seas must be used as pathways to improved international understanding and cooperation."

The U.S. has recognized the great potential of the seas, the President points out. Over the past 6 years, the U. S. has put more and more money into developing marine scientific and technical manpower, ships, and facilities. "The quality of our research fleet, deep sea vessels, and laboratories is unsurpassed," he notes. The number of highly trained specialists is growing, and this "provides a strong creative base for our marine science and technology."

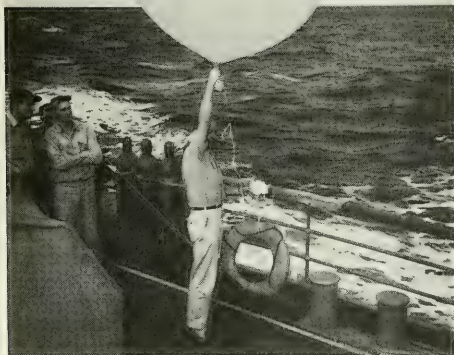


Fig. 1 - Weather balloon launched from ships to gather information on upper air. Weather reports from many ships are used to prepare forecasts for aviation and marine interests.

(Photo: ESSA)



Fig. 2 - SCUBA diver capturing young salmon for study of fish behavior.
(Photo: Oregon Fish Commission)

The President acknowledges the contributions of the 89th Congress to meeting the challenge of the oceans. It enacted:

• The Marine Resources and Engineering Development Act, which calls on the President to develop a long-range, comprehensive, and coordinated U. S. program in marine science--aided by the National Council on Marine Resources and Engineering Development, and an advisory Commission on Marine Science, Engineering, and Resources.

• The Sea Grant College and Program Act. This will improve U.S. capabilities for training and research in marine science and engineering.

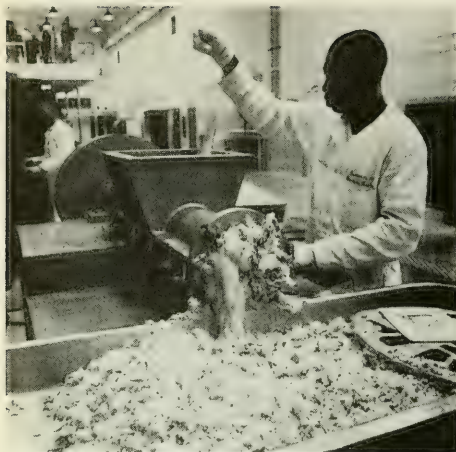


Fig. 3 - Red hake is dropped into grinder--producing, after water and fats are dissolved in alcohol, fish protein concentrate (FPC).



Fig. 4 - FPC looks like a light-tan flour and is virtually odorless and tasteless.

• Authorization for pilot plants to produce fish protein concentrate.

The National Council identifies the areas in which the U. S. should carry out these actions:

- Begin a pilot program to help the world's protein-deficient nations increase their capacity to use the ocean's fish resources to feed their people.

- "Implement the Sea Grant College and Program Act to strengthen oceanographic engineering, expand applied research, and improve technical information activities."

- Speed studies to find ways of improving the "collection, storage, retrieval and dissemination of oceanographic data."

- Enlarge the systems of ocean observation to improve near-shore weather prediction services. Study ways to increase the accuracy of long-range predictions of precipitation levels and drought conditions.

- In Chesapeake Bay, determine the effects of estuarine pollution on shellfish, health, recreation, and beauty. Provide a plan to remedy the situation.

- Explore the solid mineral deposits offshore.

- Improve technology and engineering to make it possible to work at great ocean depths.

- Equip a new Coast Guard vessel to carry out oceanographic research in sub-Arctic waters.

President Johnson also notes his recommendation to Congress for a 13-percent increase--from \$409 to \$462 million--in funds to support marine science activities. The money will permit expansion of the current efforts to understand the sea and develop its enormous resources. It will strengthen the capabilities of private industry, universities, and local government to participate in this undertaking. Also, it will help carry out the recommendations of the National Council.

The report states that significant progress was made in the marine sciences in the 1960s, but the total enterprise today, both public and private, is still small--only about 3 percent of the total U. S. technical effort.



UNITED STATES

Fishery Products Exports Rose 22%

The value of U. S. exports of fishery products rose to a record \$84.8 million in 1966--an increase of \$15.3 million, or 22 percent, over 1965. Exports were \$32.7 million, or 63 percent, greater than the 1961-65 average of \$52.1 million. Exports of edible products totaled 109,604,000 pounds valued at \$62,882,000. (In 1965, 96,444,000 pounds worth \$49,308,000).

Nonedible products were valued at \$21,931,000 in 1966 and \$20,175,000 in 1965.

There was a large increase in exports of frozen salmon, prepared or preserved fish and shellfish, and unmanufactured shells. Exports of frozen salmon were 9.3 million pounds--88 percent larger than in 1965. Canada, Sweden, United Kingdom, France, and Japan imported larger amounts in 1966. There were no indications of new markets elsewhere.

Exports of prepared or preserved fish (includes canned) increased 5.6 million pounds, or 174 percent. Large shipments went to Japan (4.7 million pounds) and to the Congo (2.5 million pounds). The high value of exports to Japan suggests that they consisted mostly of salmon eggs (soaked in brine, packed in cellophane lined boxes, and frozen) and herring spawn and kelp. The low value of shipments to the Congo indicate mostly canned river herring and Maine herring.

Shellfish Exports

Exports of prepared or preserved shellfish (includes canned) increased 2.4 million pounds, or 60 percent. Large shipments were sent to Sweden, Denmark, United Kingdom, and France. Over one million pounds were sent to France in 1966; only 300,000 pounds in 1965. (Canned king crab and lobster--but not frozen king crab or live lobster--are included.)

Exports of fish oils (77.3 million pounds) were below the 103.8 million pounds exported in 1965. Exports of seal furs were worth

\$4.1 million; in 1965, \$6.1 million. Total exports of nonedible items would have been considerably lower than in 1965 except for the remarkable trade increase in unmanufactured shells. Over 64 million pounds valued at \$9.2 million were exported in 1966--compared to 36 million pounds worth \$4.1 million in 1965. Of the total, 51.3 million pounds, or 80 percent, were sent to Japan, and 11.3 million pounds, or 18 percent, to Canada. (BCF Branch of Fishery Statistics.)



Breaded Shrimp Production Increased 6%

U. S. production of breaded shrimp during 1966 was 104 million pounds--up 6 percent over 1965.

The Inland and Gulf States ranked first with 63.6 million pounds, followed by the Atlantic States, 33.4 million, and the Pacific States, 7 million.



Fish Sticks and Portions Output Rose Slightly

U. S. production of fish sticks and portions during 1966 was 227.9 million pounds worth \$93.5 million--up 2.2 percent in quantity and 1.8 percent in value compared to 1965.

Fish sticks totaled 81.3 million pounds in 1966--1.2 million pounds, or 1.4 percent, lower than 1965. Fish portions amounted to 146.6 million pounds--up about 6.2 million pounds, or 4.4 percent.

Cooked fish sticks (about 77 million pounds) were 94.7 percent of the 1966 fish stick total; the remaining 4.3 million pounds, or 5.3 percent, consisted of raw fish sticks.



Gulf Oil Rigs Are Shipping Hazard

The U. S. Coast Guard says that the large increase in offshore oil rigs and related marine structures in the Gulf of Mexico has created a serious hazard to navigation. To stop the rising number of accidents, the Coast Guard's New Orleans district has accelerated its campaign to tell mariners where 7,000 "artificial islands" and "artificial reefs" are located in the waters off Louisiana and Texas.

The Coast Guard was instrumental in establishing "fairways" for shipping. These are 2-mile-wide channels stretching from a port's entrance to deep water and kept free of oil-drilling equipment. The equipment consists of drilling rigs (from fixed-platform to ship-hulled rigs), processing and storage platforms, producing wells and capped wells. Most of the equipment is scattered in the bays and bayous of Louisiana and Texas.

Many Structures Far Offshore

About 2,000 structures are far offshore, some 70 miles from the coast. Moreover, the number of submerged wells (completed and capped underwater) has increased greatly. Made of heavy steel, these wells could severely damage ships.

As oil wells advance farther into the Gulf, the Coast Guard is urging the creation of fairways running parallel to the shore. Without these connections to the access fairways, ships seeking safe passage must travel long and uneconomic distances to the sea.

Maritime interests and the offshore oil industry are looking for an agreement on these "marine highways."

The offshore operation in the Coast Guard's New Orleans district is the world's largest, says the district's commander, Rear Adm. J. D. Craik. His command sees that all structures have lights and fog horns that work properly. All submerged wells coming to within 85 feet or less of the surface must be worked with a lighted sound buoy to warn navigators.

Coast Guard Checks Structures

The Coast Guard inspects about 14,000 of these private aids to navigation and there are a thousand more of them every year. It issues notices to mariners telling of the structures. It sees that position and signal data are available to charting agencies for inclusion in nautical maps. These maps have

to be revised constantly; it is almost impossible for chart makers to keep up with new marine installations.

To ease this problem, the Coast Guard has begun to issue to mariners its own local notices with the latest information. It is urging all navigators to use them. (From article by Tania Long, "The New York Times," April 16, 1967.)



Scientists Warn Against Lake Erie's Increasing Pollution

The growing pollution of Lake Erie must be stopped before it becomes a health hazard and limits the lake's usefulness for industrial purposes, University of Michigan and BCF scientists told a recent meeting of the American Institute of Chemical Engineers. Prof. L. L. Kempe, of the university's department of chemical engineering, and James W. Moffett, director, and John F. Carr, research biologist, of BCF's Biological Laboratory in Ann Arbor, reported that the principal source of pollution comes from the Detroit River and industrial and urban development around the lake.

They said standard sewage treatment methods are inadequate to protect fresh water lakes and streams. Protection must come through the total exclusion of pollutants; wastes must not be dumped into the water, they must be totally distilled, and polluted rivers should be bypassed around the lake.

"Recreational and commercial values of Lake Erie, the world's 12th largest lake, have deteriorated substantially in the past 50 years," and our complex society is "accelerating the decadence of the Great Lakes as we know them."

Sewage systems, industry, and shipping are helping to pollute tributaries and inshore waters and to create an increasingly foul lake bottom.

The Lake's Death Can Be Regulated

The scientists said that "the death of Lake Erie can be regulated, much as we now slow the rusting of steel, the rotting of timbers, or the demise of man himself." Although "changes

in the physical and chemical properties of the water have been relatively mild," they added, the bottom deposits, periodic lack of oxygen, and rapid increase of nutrients have drastically affected plants and animals.

At present, even the best sewage-treatment processes remove only part of the carbonaceous biological oxygen demand; they do little to remove nutrients such as nitrates and phosphates. Complete exclusion of even treated sewage and industrial wastes from surface waters is desirable. This can be done by regulating waste water and permitting its reuse for industrial and domestic water supplies.

Pollution has contributed to an increase in sludge worms and to the elimination of the mayfly, "a clean water insect and a prime source of food to the fishes that inhabit the lake." And this has drastically reduced whitefish and walleye pike and has made blue pike and lake herring "now nothing more than museum pieces."

While noting that current pollution abatement efforts promise direct and immediate benefit, particularly in the tributaries and inshore waters of the Lake Erie basin, the scientists said much more is needed. To save the open waters, research must begin immediately to determine how much pollution Lake Erie can receive without harming the native species of fish and fish-food organisms. Unlike rivers, lakes do not have a great capacity for cleansing themselves. The pollution load entering Lake Erie apparently is being concentrated in the bottom sediments, the major cause of oxygen depletion. New ideas must be developed and used to attack the environmental problems of Lake Erie, particularly those connected with the sediments.



U. S. Commercial Fleet Grows

The U. S. commercial fishing industry added 816 vessels to the fleet in 1966, the highest number since the 1,002 additions of 1949. Nearly half the new vessels--373--list home ports in Gulf Coast states; 202 list Pacific Coast home ports. The vessels range from 20 to 175 feet long.



Oceanography

RESEARCH SHIP "DISCOVERER" COMMISSIONED

The USC&GSS Discoverer, America's newest deep sea research ship, was commissioned April 29 at Commodore Point, Jacksonville, Fla. The \$10,000,000 "floating laboratory" is the sister ship of the USC&GSS "Oceanographer," which left Jacksonville March 31 on an 8-month, 37,000-mile, global scientific expedition.

The Discoverer joins a fleet of 15 oceanographic and hydrographic survey and wire drag ships of the Coast and Geodetic Survey, U. S. Department of Commerce's Environmental Science Services Administration (ESSA). She will be based on the east coast.

Her keel was laid in 1963 and the ship launched in 1964. The Discoverer and the Oceanographer are the largest and most automated oceanographic research vessels in the U. S. Each vessel boasts an electronic brain capable of performing 100,000 calculations per second. The computer will gather and process enormous amounts of oceanographic data and monitor the ship's automated central engine room control.



Research ship USC&GSS Discoverer. (Photo: ESSA)

Has the Latest Equipment

The Discoverer is equipped with closed-circuit television to assure proper operation of the electronic equipment. The ship has a central well that extends vertically through the vessel. Special experimental equipment can be lowered through it and oceanographers using diving equipment can enter and leave the vessel.

Special bow-viewing ports below the water line will permit underwater observations.

The vessel is strengthened for navigation in ice and has extensive specialized electronic and mechanical equipment for oceanographic, meteorologic, and geophysical observations. Laboratory space of over 4,100 square feet will allow shipboard analysis of collected data and samples. All living and working areas are air conditioned and served by interconnecting communication facilities.

The 303-foot, 3,800-ton Discoverer and her sister ship were constructed as part of a 10-year national oceanographic program to obtain vitally needed knowledge of the seas. The program was developed by the Inter-agency Committee on Oceanography of the Federal Council for Science and Technology.

* * *

NEW EDITION OF ATLANTIC COAST NAUTICAL BOOK PUBLISHED

The Coast and Geodetic Survey (CGS) has published a new edition of "U.S. Coast Pilot 2," a 230-page nautical book describing a 267-mile stretch of the Atlantic Coast from Cape Cod, Mass., to Sandy Hook, N. J. The last edition of the book was published in 1960. CGS is an agency of the Commerce Department's Environmental Science Services Administration.

CGS publishes 8 Coast Pilots for all U.S. coastal and intracoastal waters. New editions appear every 4 to 10 years. Generally,



Area covered by new edition of U. S. Coast Pilot 2, a 230-page nautical book describing the Atlantic Coast from Cape Cod, Mass., to Sandy Hook, New Jersey.

the books furnish information that cannot be shown graphically on marine charts, e.g., "navigation regulations, outstanding landmarks, channel and anchorage peculiarities, dangers, weather, ice, freshets, routes pilotage, and port facilities." Cumulative supplements contain changes reported since the most recent editions and are published early each year.

The first edition of Coast Pilot 2 was published in 1918. The new seventh (1966) edition describes the Port of New York and other deep-water ports at New Bedford, Mass.; Providence, R. I.; New London, New Haven, and Bridgeport, Conn.; and Albany, N. Y. It describes the fishing and recreational waters of Nantucket, Vineyard, Rhode Island, Block Island Long Island Sounds, and the waters off Long Island's south coast.

Cover Other Waters and Ports

The Coast Pilot also covers the waters and ports of Buzzards and Narragansett Bays, Providence River up to Providence, R. I., Thames River up to Norwich, Conn., Connecticut River up to Hartford, Conn., Housatonic River up to Derby and Shelton, Conn., the Hudson River up to Troy, N. Y., and the New Jersey rivers of Passaic, Hackensack, Raritan, Shrewsbury and Navesink.

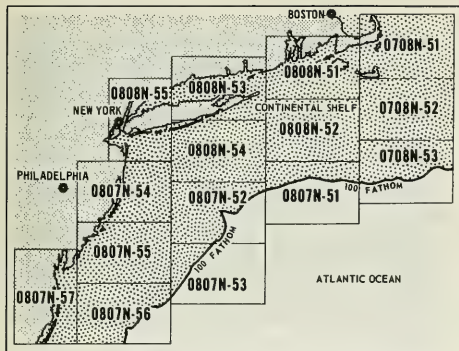
Besides serving the maritime shipping industry, the new edition, coordinated with many of CGS' new small-craft nautical charts, serves the small-boating community.

Copies may be purchased for \$2.50 from the Coast and Geodetic Survey (attn. C44), Rockville, Md. 20852, or from Survey sales agents throughout the area. The annual Supplements are free.

* * *

NEW MAPS DEPICT 400-MILE STRETCH OF ATLANTIC SEABED

New maps covering the Atlantic Ocean seabed off a 400-mile stretch of the Massachusetts to Maryland coast have been issued by the Coast and Geodetic Survey of the U. S. Department of Commerce's Environmental Science Services Administration. They depict the mid-Atlantic continental shelf from Cape Cod to Chincoteague Bay--covering an area extending over 100 miles offshore to the shelf's 600-foot edge and beyond, to a depth of 3,000 feet.



Seabed off mid-Atlantic coast covered by 15 new bathymetric maps. Individual maps are identified by number.

The bathymetric maps portray in detail the topography of the seafloor by depth contours at one fathom (six feet) intervals to the 100-fathom curve, and 10-fathom (60 feet) intervals to the 500-fathom curve. Submarine features are emphasized by gradient tints and include Nantucket Shoals; Phelps and Davis Banks; Hudson, Black, Atlantis, Veatch and Hydrographer Canyons; and the approaches to Long Island Sound, New York Harbor, and Delaware Bay.

The maps cover about 40,000 square miles of the Atlantic continental shelf. Produced at

a scale of 1:125,000, they represent the most detailed bathymetric coverage ever published of this area's seabed.

Captain Lorne G. Taylor, chief, CGS Marine Chart Division, said the maps will be used by the New England Regional Development Commission and will provide "a foundation for future exploratory efforts and geophysical measurements. Development of the economic potential of the offshore areas is heavily dependent upon maps of this kind. Knowledge of the sea bottom is important for the extension of fisheries, for mineral exploration, for study of shoreline accretion and erosion, and for use in marine engineering."

The maps were produced under a cooperative arrangement between the New England Regional Development Commission, Coast and Geodetic Survey, Interior Department's Bureau of Commercial Fisheries, and Commerce Department's Economic Development Administration.

The series of 15 maps may be purchased for 40 cents each by mail from Coast and Geodetic Survey (Attn. C44), Rockville, Md. 20852; by mail or in person from Coast Survey Chart distribution centers at 121 Customhouse, San Francisco, Calif. 94126, and 602 Federal Office Bldg., 90 Church St., New York City 10007; and in person from Coast and Geodetic Survey, Commerce Building, Room 1127, Washington, D.C. 20230.



Created in 1849, the Department of the Interior—a department of conservation—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.



Foreign Fishing Off U. S. Coasts, March 1967

IN NORTHWEST ATLANTIC

The surveillance of foreign fishing off the U. S. North Atlantic coast in March 1967 was hampered by poor weather. Only a limited assessment of the situation was possible.

Soviet: The estimated number increased gradually from 35 to 40 vessels early in the month to about 60 by month's end, when additional medium and large side trawlers and support vessels arrived. (During February 1967, 40 vessels were sighted; in March 1966, over 100.)

Soviet fishing generally ranged along the 100-fathom curve of the Continental Shelf from south of Long Island, New York (Hudson Canyon), to south and southeast of the Nantucket Lightship (Hydrographer Canyon). But most fishing was inside ICNAF subarea 5; only a few vessels fished west of ICNAF's western border south of Long Island. Moderate catches of fish on deck appeared to be primarily red hake and whiting, the same species landed in March 1966.

On some large stern factory trawlers, the Soviets have replaced rollers consisting of 30"-diameter steel bobbins with 12"-diameter rubber rollers. An estimated 4 rollers are used for every 6-foot section of the sweep. Three 4"-diameter spacers are attached between each roller. Reducing the size of rollers allows the trawl net to fish considerably closer to the ocean floor--and capture a higher percentage of bottom-dwelling species. These adjustments also will allow the trawl gear to fish effectively on both rough and smooth bottom. This lessens the workload of crews by eliminating frequent changing of gear when bottom conditions suddenly change. Finally, the changes tend to lighten the trawl and could allow the vessel to cover a greater distance during the same towing time.

IN MID-ATLANTIC BIGHT

Soviet: Fishing was discontinued in early June 1966. Soviet vessels were sighted only occasionally, mostly on their way to the newly opened Havana fishing port, and further south into the expanding Soviet fisheries off Argentina. Some limited exploratory research also was done during intervals in the fishing.

At the end of February 1967, the Soviet fleet again reappeared off Virginia, Maryland, Delaware, and New Jersey. Fewer than 10 vessels were sighted; there had been 30 vessels fishing in the area a year earlier. On March 30, 1967, a surveillance flight by U. S. Coast Guard and BCF officers sighted 7 Soviet vessels--5 factory stern trawlers and 2 medium side trawlers. Six vessels were located along the 100-fathom curve from 80 miles east southeast of Cape May, N. J., to 90 miles east of Atlantic City. A single trawler was sighted 25 miles east of Cape Henry, Va. Though all vessels were fishing, no fish was observed on deck. Dehydration plants were operating on several vessels. Reports from Hampton, Va., fishermen indicate the Soviets are taking herring (river herring) and small scup (porgies).

OFF SOUTH ATLANTIC

Japanese: Taiyo Fishing Company's exploratory trawler has found poor fishing for shrimp and bottomfish off the South Atlantic coast. As of early March, catch per day of operation averaged only 5 to 6 metric tons of bottomfish, with very small quantities of shrimp. The vessel is believed operating well beyond the U. S. 12-mile zone.

IN GULF OF MEXICO

No foreign vessels were reported fishing off or near the U. S. Gulf Coast, but several Soviet vessels were sighted on their way south (to Havana port and then to southwest Atlantic) through the Florida Straits.

OFF CALIFORNIA

Soviet: From 1 to 6 vessels were sighted fishing off the California coast during March, indicating fishing is still only exploratory. Most were sighted off the San Francisco area, and some were passing through on their way south to fishing grounds off Mexico.

On March 31, 1967, the U. S. Coast Guard and California Department of Fish and Game identified 6 Soviet vessels 22 miles southwest off Half Moon Bay (San Mateo County near San Francisco) as 5 medium side trawlers and a 3,600 gross-ton refrigerated transport (the "Gutsul", recently constructed in Poland). The trawlers were fishing in 100-130 fathoms; the catch appeared to be rockfish. This was the same area the Soviets explored at end of January.



Fig. 1 - The refrigerated fish carrier Gutsul (3,600 gross tons) was providing support to 6 Soviet medium trawlers fishing off California's Half Moon Bay in early April 1967.

OFF PACIFIC NORTHWEST

Soviet: During March, there were about 10 Soviet fishing and support vessels off the coast of Oregon. They remained for a week, then most headed north. By month's end, only 4 vessels remained off Oregon. No vessels were sighted off Washington.

The vessels were catching hake, true cod, ocean perch, and other rockfish. The catches observed consisted primarily of hake and true cod. The largest amount was about 20 metric tons taken in one drag by a stern trawler, consisting primarily of true cod with some ocean perch.

During the month, several research vessels continued to explore the resources off both Oregon and Washington. The "Ogon" was sighted fishing on March 3, about 70 miles northwest of Cape Flattery (Washington) in 200 fathoms. By month's end, the Ogon was exploring about 30 miles off Cape Arago (Oregon). Other Soviet research and exploratory vessels were sighted mainly off Oregon.

Japanese: In March, the Japanese had up to 4 stern trawlers off Washington and Oregon catching ocean perch primarily. The perch were cleaned and frozen in 60-pound packages. The viscera were reduced to meal and oil aboard the vessels.

The captain of the "Taiyo Maru" said in an interview that the total fish catch did not warrant licensing more Japanese vessels to fish off the U. S. Pacific Northwest. As of

March, 3 stern trawlers, each accompanied by a side trawler, were licensed to fish in that area.

OFF ALASKA

Japanese: The number of Japanese vessels fishing off Alaska increased from about 36 to over 90 during March. Most of the increase was in eastern Bering Sea pollock and king crab fisheries.

Pacific ocean perch fishing in the Gulf of Alaska was concentrated on the Yakutat grounds and on Albatross Bank throughout the month. The factory trawler "Kokuyo Maru" fished in Yakutat in early March, shifted briefly to Albatross Bank, and then presumably returned to Japan. The factory trawler "Kirishima Maru" fished for perch in Yakutat during second half of March. Perch fishing on Albatross Bank was conducted throughout the month by the factory trawlers "Daishin Maru No. 12" and "Yutaka Maru." The factory trawler "Ryuyo Maru" departed Albatross Bank in early March and returned to Japan. The factory trawlers "Akebono Maru No. 72" and "Aso Maru" and another trawler were fishing for perch along the 100-fathom curve south of the Pribilof Islands in late March.

The factoryship fleets in the Alaska pollock fishery north of the Fox Islands in the eastern Aleutians increased from 2 to 4 during March. Active at month's end were the factoryships "Soyo Maru," "Chichibu Maru," "Shikishima Maru," and "Gyokuei Maru." Those vessels are licensed to be accompanied by 62 trawlers. Independent trawlers also active included the "Zuiyo Maru No. 2," "Akebono Maru No. 52," "Inase Maru No. 5," and the "Tenyo Maru No. 3." The Tenyo Maru No. 3 returned to Japan at month's end.

The Japanese eastern Bering Sea king crab fishery started in early March. The vessels were the factoryships "Keiko Maru" and "Tainichi Maru," each accompanied by 5 net-setting trawlers.

Sablefish operations were conducted by the long-line vessel "Kotoshiro Maru No. 25" off Chirikof Island in early March. One long-liner off Cape St. Elias, and one off South-eastern Alaska, were reported in late March.

Soviet: Fishing and support vessels off Alaska increased from about 130 in early

March to over 150 by month's end. The number was about the same as in March 1966.

During the month, a significant shift occurred in the Soviet eastern Bering Sea flounder fishery; most of the effort, over 70 vessels in early March, was switched to Gulf of Alaska ocean perch fishing.

In the Bering Sea flounder fishery, the catch rates had dropped off sharply as the large schools of fish began to disperse. Early in the month, several vessels were detached and sent to Gulf of Alaska to explore for Pacific ocean perch. Because ocean perch were located, some flounder-fishing vessels moved into the Gulf. Decreasing flounder catches in early March in the Bering Sea prompted a large exploratory effort. Many vessels were temporarily assigned to exploration and soon found new resources. As a result, the flounder fleet in the Eastern Bering Sea increased somewhat by mid-March; catches were moderate to good. But the rally was short-lived. By month's end, it appeared the flounder season was about finished. Only about 30 vessels remained.

The Gulf of Alaska ocean perch fishery effort doubled during March as more fishing and support vessels entered the area--some from the Bering Sea flounder fishery and some new arrivals from Siberian ports. The main perch fishing areas were on Portlock Banks (east of Kodiak Island), near the Yakutat Bay in the Central Gulf, and off Southeastern Alaska. Early in March, 30 fishing trawlers and 4 support vessels fished for perch on Yakutat grounds. By mid-March, that group broke up and fishing operations were switched west to Portlock Bank and southeast below Chichagof Island.

Portlock Bank was fished for only a short time; by month's end, all vessels returned to Yakutat grounds, further southeast along Alaska's and Canada's coasts, or returned home.

In mid-month, about 15 trawlers were perch fishing off southeastern Alaska (from Chichagof Island to Canadian border). At end of March, about 25 trawlers, joined by 5 processing and support vessels, were there.

The continuous shifting from area to area indicates extensive exploration was conducted on the by-now traditional Soviet ocean perch grounds in Gulf of Alaska and adjacent

areas. As perch schools were found, the fleets followed the scouting vessels. Despite some success, the size of perch schools reportedly was small both in the Gulf and along Aleutians. It is not impossible that the abundance of virgin perch stocks fished by Soviets since 1962 has decreased considerably. In 1966, only about 250,000 metric tons of Pacific ocean perch were caught off U. S. coasts by Soviets, compared to 392,000 tons landed in 1965.

Only a few vessels fished for perch along tip of Alaska Peninsula, and along Aleutian Islands. Their number increased to 6 fishing trawlers and 1 refrigerated transport by end of March.

Shrimp fishing on Continental Shelf near Shumagin Islands continued with 20 medium freezer trawlers serviced by floating cannery "Vasilii Putintsev." Shrimp were unusually abundant and, by end of February, the Soviets processed over 5,000 metric tons of small Pacific shrimp. Since shrimp are more abundant closer to shore, vessels were fishing inside newly established 12-mile fishery zone until U. S. Coast Guard seized 2 shrimp vessels, both fined in U. S. courts. Soon afterwards, many shrimpers left Shumagin area and continued operations off Afognak Island (adjacent to Kodiak Island). By end of March, 15 medium trawlers, one canning factoryship, and one refrigerated transport were sighted off Afognak; only 5 trawlers still remained on Shumagin shrimp grounds.

The king crab fishery in eastern Bering Sea began in first week of March, when one floating cannery accompanied by 3 net-setting medium trawlers arrived from Vladivostok. Soon 2 more sisterships arrived, also with net-setting trawlers. As in 1966, it is believed the 1967 effort will not exceed 3 canning factoryships, 9 medium trawlers, and 33 pick-up boats. But unlike 1966, the Soviets began somewhat earlier this year.

The king crabbing is regulated by U. S.-USSR agreement. In 1966, Soviet vessels in eastern Bering Sea caught 2.6 million adult male crabs and produced 104,700 cases (48 $\frac{1}{2}$ -lb. cans) of canned crab meat--only 88 percent of agreed yearly quota of 118,600 cases. During February 1967 negotiations, it was agreed that the 1967 Soviet pack should be 15 percent less, or 100,000 cases. It is believed the Soviets will try their best to achieve the agreed-on quota.

SOVIET FISHING VESSELS SEIZED

During a fishery patrol on March 2, 1967, the U. S. Coast Guard cutter "Storis" observed Soviet medium freezer trawler "SRTM-8413" fishing close to U. S. shore off southern Alaska Peninsula (158°56' W. and 55°50' N., or about 1.3 miles off Mitrofanina Island, northwest of Shumagin Islands). The Storis ordered the vessel to stop for boarding, but captain attempted to leave area. While steaming full speed towards international waters, the vessel dropped its trawl and also dumped unspecified material overboard. Overtaken 13 miles off U.S. coast, the SRTM finally stopped and allowed an armed Coast Guard party to board her. The Soviet captain was told that he had broken U. S. law and the vessel would be escorted into the Sand Point Coast Guard Base. On March 3, at 2 a.m. Alaska time, the SRTM-8413 began to steam towards Sand Point, escorted by the Storis. In about 2 hours, however, the Soviet mothership "Vasilii Putintsev," which was servicing the shrimp-fishing trawlers and is flagship of the Commander of the Soviet Pacific Shrimp Expedition, Vasilii Guzenko, intercepted the convoy. The Soviet Commander requested and was granted 2 conferences with Comdr. George Hardy Jr., Commanding Officer of the Storis, to review the situation and to delay departure of SRTM-8413 until the Far Eastern Administration at Vladivostok would permit Guzenko to accompany the captain into Sand Point. It took 14 hours to obtain permission and board the trawler guarded by the Coast Guard prize crew.

Early on March 5, the two Soviets were flown by Coast Guard to Kodiak, where the Soviet captain was arraigned before a U. S. Commissioner and charged with violating U. S. fishery and territorial laws. Awaiting the party there was an official of the Soviet Embassy in Washington and a court-appointed attorney.

The SRTM-8413 and its crew were released the same day, and the vessel proceeded out beyond the U. S. 12-mile zone. On March 6, the trial took place at Anchorage and the Soviet Captain was fined US\$5,000. He pleaded *nolo contendere* (not admitting guilt but not contesting the evidence, thus subjecting himself to conviction as though admitting guilt). The maximum sentence that could be imposed (once vessel was released) was a fine of \$10,000 and a one-year prison sentence. This was the first time the U. S. had seized a Soviet fishing vessel and prosecuted its captain for violation of territorial waters.



Fig. 2 - Soviet medium freezer trawler SRTM-8413 apprehended by U. S. Coast Guard fishing inside U. S. territorial waters. Answering signals of the U. S. Coast Guard cutter Storis. (Photos: U. S. Coast Guard)



Fig. 3 - A crewman of Soviet trawler SRTM-8413 uncovers a catch of Pacific shrimp caught off U. S. coast.

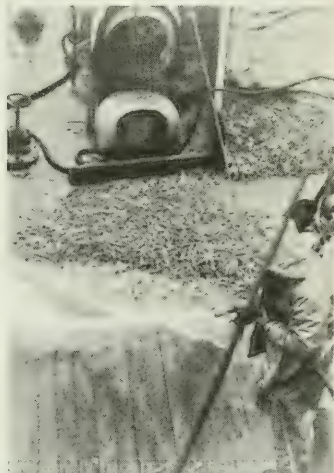


Fig. 4 - Spoiled shrimp aboard Soviet trawler are washed back into the sea.

The Soviet captain was released on March 7 and, along with the Fleet Commander, transported by the Storis to a Soviet vessel at sea. The fine was paid by the Soviet Embassy in Washington on March 20.

On March 10, a U. S. Coast Guard patrol observed 3 Soviet medium freezer trawlers inside the 9-mile contiguous fishery zone off the Shumagin Islands (Alaska). One was 3.5 miles offshore. Of the 3, only 1 trawler fishing for shrimp was identified as the SRTM-8421 "Valentina Tereshkova." The others were also probably catching shrimp.

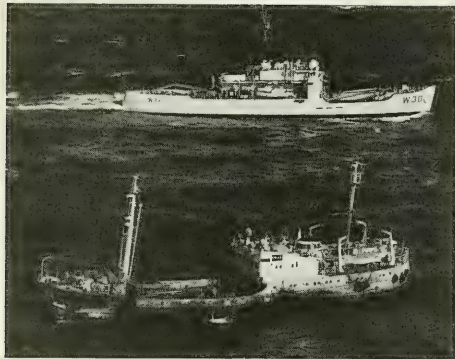


Fig. 5 - Twice in less than 3 weeks, crew of U. S. Coast Guard cutter Storis (W 38) stopped and boarded a Soviet shrimp trawler violating U. S. fishery laws off Alaska. Storis is shown preparing to lower boat with boarding party. The medium freezer trawler SRTM-8457 (foreground), is watched by a Coast Guard aircraft, from which photo was taken.

On March 22, a Coast Guard aircraft sighted a Soviet fishing vessel 5.5 miles east of Seal Cape (Alaska) and identified it as "SRTM-8457." The vessel had nets in the water and thus was fishing well within the 9-mile contiguous fishery zone. The aircraft signaled the vessel by radio, flashing lights, and message block to stop, but the vessel hauled in her nets and departed. The aircraft maintained "hot pursuit" and contacted the nearby cutter Storis. Her personnel boarded the vessel 15 miles from the U. S. coast. The Soviet captain admitted fishing when first sighted but believed he was out more than 12 miles. A prize crew was placed aboard the vessel, but the captain (supported by the Fleet Commander) protested the seizure and stated the vessel would not proceed to a U. S. port under her own power. The 700-gross-ton medium freezer trawler had to be towed by the Storis for 48 hours before arriving at St. Paul Harbor, Kodiak.

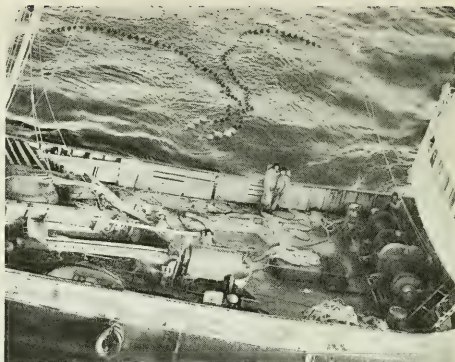


Fig. 6 - A small U. S. Coast Guard plane hovers over Soviet medium freezer trawler SRTM-8457 as it takes aboard a load of shrimp only 6 miles off U. S. Alaskan coast. The trawl bag containing shrimp (middle left) was pulled aboard, but wings of the trawl and headline floats (upper middle) are still alongside vessel.



Fig. 7 - Some of fresh shrimp found aboard SRTM-8457 after seizure by Coast Guard.

The Soviet captain was tried in the Anchorage District Court and given a \$10,000 fine to be paid immediately. Unable to pay, he was held overnight, until Iruii Chemokhud of the USSR Embassy in Washington paid the fine. The captain was released and transported to his vessel. The Soviet diplomat stated that the Soviet Government respects its international obligations and that the captain would lose his master's license for one year and would have to repay the fine to the Soviet Government.



STATES

Alaska

HIGHLIGHTS OF 1966

BCF Juneau reports:

- Alaska remains the number 1 fishery state with landings valued at \$74 million and products worth about \$200 million--25 percent greater than California's, the number 2 state.
- Kodiak (population 3,500) is the Nation's third most important fishery port with landings worth \$13 million--\$3 million more than Boston.
- Fish eggs cured in Alaska during 1966 were worth \$4 million, or about 25 percent of the wholesale value of products from the U. S. Pacific halibut fishery. Salmon roe amounted to \$3 million; herring roe \$350,000; cured kelp with herring eggs (harvested during a 45-minute season) \$600,000.
- The value of the herring roe and kelp products matched the wholesale value of meal and oil produced in Washington State (from hake and other species). It was nearly twice the value of meal and oil produced in either Oregon or in the Lake Michigan alewife fishery.
- Alaska salmon egg and herring egg products are exported to Japan and represent about 6 percent of U. S. fishery exports.
- The salmon catch was 352 million pounds, the best since 1949.

• King crab continued as Alaska's second most important fishery--landings hit a record 159 million pounds. Products of this fishery were worth \$38 million, three times the value for products of the U. S. Pacific halibut fishery.



Arkansas

BCF AIDS IN HARVESTING CATFISH

During the first 3 months of 1967, BCF gear specialists harvested 108,000 pounds of catfish from Arkansas farm ponds for demonstration purposes. The ponds ranged from

5 to 40 acres, individual seine hauls caught from 600 to 42,000 pounds. BCF designed live-cars were used to hold the captured fish in good condition for 1 or 2 days.

In the 40-acre pond, 87 percent (63,000 pounds) were caught in 2 hauls. In a 10-acre pond, 89 percent (18,300 pounds) were taken in 2 hauls. The results were poor only in ponds containing snags, such as roots or stumps, or in ponds with undesirable design features.

Commercial pond-fish production is expected to grow this year.



California

DIVIDED 1966 ALBACORE LANDINGS WITH OREGON

The March report of the Resources Agency of California states that preliminary albacore landing figures show Oregon and California divided the 1966 commercial landings almost equally--California 18.2 million pounds, Oregon 18.0 million. It was the best season since 1944 for Oregon, the worst since 1947 for California. Washington landings totaled 1.1 million pounds.

The report discloses that Northern California crab fishermen are enjoying a very good year. Over 8 million pounds of high quality crabs have been landed. Good catches are predicted for another month or two. In the San Francisco area, however, the season's catch will be low, a little over 300,000 pounds. These are the grounds that historically produced 3 to 4 million pounds per season.

TROUT FLOWN TO MOUNTAIN LAKES

Over seven million of California's trout and kokanee salmon fingerlings took to the air in 1966, reports the California Department of Fish and Game (DFG). They were planted in high mountain lakes by DFG's warden-pilots flying twin-engined Beechcraft airplane.

DFG has been air planting more than 800 lakes annually since 1946 with 6 to 7 million fingerlings. They are planted in hard to reach places, where natural reproduction is inadequate to sustain angling pressure. This modern method of planting is a fraction of the old horseback method's expense and stocks scores of lakes never before planted.

Air Dropped Safely

Fingerling trout, less than an ounce per fish, have been air dropped safely from as high as 800 feet, but the average free fall drop is about 250 feet.

DFG pilots logged 155 hours on 104 flights to plant 819 lakes in 1966. Planting is done in the summer, as soon as the ice melts. Some fingerlings reach catchable size in a year; some take 2 years.

The 1966 plants were: 1,754,145 rainbow trout, 614,132 eastern brook, 4,152,842 kokanee, 75,305 browns, 249,340 Lahontan cutthroat, and 304,400 golden trout.

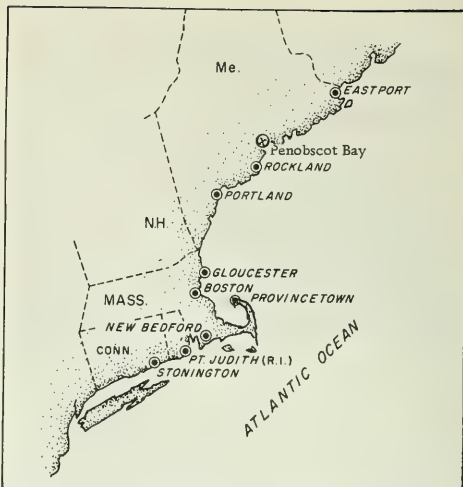


Maine

U. S. AGENCY ASKS PENOBSCOT BAY AREA TO CUT POLLUTION

The Federal Water Pollution Control Administration (FWPCA) told the Penobscot Bay area of Maine on April 20 in Belfast, Me., to reduce the pollution of shellfish beds by 1970 or face Government penalties. Last year, Senator Edmund S. Muskie of Maine introduced amendments to the Federal Water Pollution Control Act that empower Interior Department to initiate action when substantial economic injury is involved in navigable waters.

Secretary of the Interior Stewart L. Udall called the Conference of Maine and FWPCA officials in Belfast because he found that the discharge of wastes from industries and communities into the bay area have damaged clams and prevented their sale in interstate commerce. FWPCA is Interior's enforcement agency, backed by the Department of Justice.



Penobscot Bay shore (cross).

Maine Closes Valuable Shellfish Beds

A FWPCA report states that pollution impelled the State of Maine to close shellfish beds near Northport, Belfast, Searsport, Stockton Spring, Penobscot, and Castine. These waters have an estimated 96,000 bushels of soft shell clams worth \$2-\$5 million. Because of water pollution, the last shellfish beds in upper Penobscot Bay were closed last June by Ronald W. Green, State Commissioner of Sea and Shore Fisheries. The bay once was a major source of lobsters and clams.

FWPCA listed Bangor and Brewer as the leading offenders and pinpointed municipal sewage as responsible for 65 percent of the pollution. Its report said bacterial pollution is caused primarily by the sewage. FWPCA listed 2 poultry plants in Belfast as contributing 11 percent of pollution, and industries and municipalities 24 percent. Wastes from pulp and paper companies kill fish, cause of offensive odors and discolor waters.

Penobscot Bay stretches seaward 35 miles from the mouth of Penobscot River, one of Maine's 3 major industrial streams; Kennebec and Androscoggin are the others.



Michigan

RELEASES 3 MILLION SALMON IN GREAT LAKES

About 850,000 young chinook or king salmon and 2.2 million coho (silver) salmon were released by Michigan's Department of Conservation during April and May into several Michigan tributaries of Lake Michigan and one site on Lake Superior.

The chinook plantings were the first for the Great Lakes. Hopes are high that they will be as successful as the coho planting of last spring. The rivers selected for the chinook were: Muskegon and Little Manistee on Lake Michigan, and Big Huron, near Keweenaw Bay, on Lake Superior. When released, the chinook were 3-4 inches long. If they thrive as well as the cohos, they should grow to the 15-40 pound class within their 3-5 year life cycle. About a million chinook eggs were donated by Washington State.

The Department of Conservation planned to release over 2.2 million yearling coho salmon (4-6 inches) in five streams in late April. The outlook for their development is very bright based on the results of last year's initial plantings of 850,000 fish in three streams. An estimated 2,000 cohos were caught last fall. They averaged about three pounds, but one two-foot fish weighed over seven pounds. During the first run last fall, enough egg-bearing females were caught so that state hatcheries now have 22,000 "Great Lakes" coho salmon in the sac-fry stage. The adult coho is smaller than the chinook; those on the West Coast generally are 6 to 12 pounds.

A natural food for both species is the alewife, also normally an ocean fish. The alewife adapted readily to fresh water. Its population currently is exploding in the Great Lakes. Preliminary 1966 alewife catch figures indicated a Lake Michigan total of about 29 million pounds. If the coho and chinook become established in Lake Michigan, the alewife numbers should be reduced substantially. Perhaps then the balance that existed before the lake trout (also an alewife feeder) was virtually eliminated in Lake Michigan by the parasitic sea lamprey would be approached.



North Carolina

BCF'S "OREGON" AGAIN LOCATES SCALLOP BEDS

In recent months, 10 to 12 boats were landing 5,000 to 6,000 bushels daily from the very productive calico scallop fishery conducted off Morehead City, North Carolina. But in recent weeks the catch dropped to where it was becoming unprofitable to fish. The industry asked BCF to help. The Bureau's exploratory vessel Oregon was sent to work with industry boats in surveying areas at the edges of the beds previously fished.

The survey results were good, and again several commercial vessels are each landing daily 500 to 600 bushels.

The calico scallop resources, which extend from Morehead City to southern Florida, were first outlined through BCF explorations.



Washington

SHIPYARDS ARE BUSY

Shipyards in Tacoma, Seattle, and Blaine, Washington, are filled with the characteristic sounds of shipbuilding. There is enough construction planned to keep their workers busy through 1967. At Tacoma, 6 large tuna seiners are being built. Several smaller ships are being constructed for use in the king crab and purse seine fisheries. Seattle's Pacific Fisherman Shipyard is finishing off the 91-foot Alaska king crabber. Blaine's Berg Shipyard is working on 3 vessels.

The construction under way will add 18 large new vessels to the West Coast fisheries by the end of 1967.

* * *

EDA HELPS FUND FISH PROTEIN PLANT

The Economic Development Administration, U. S. Department of Commerce, has approved \$791,000 in loans and grants to help set up a fish protein and oil extraction plant in Clallam County, Washington. A \$650,000, 20-year, business loan at 4½ percent interest was made to the Cape Flattery Co. of Seattle to acquire and modify a surplus Navy landing

ship, buy machinery and equipment, and erect building and storage facilities.

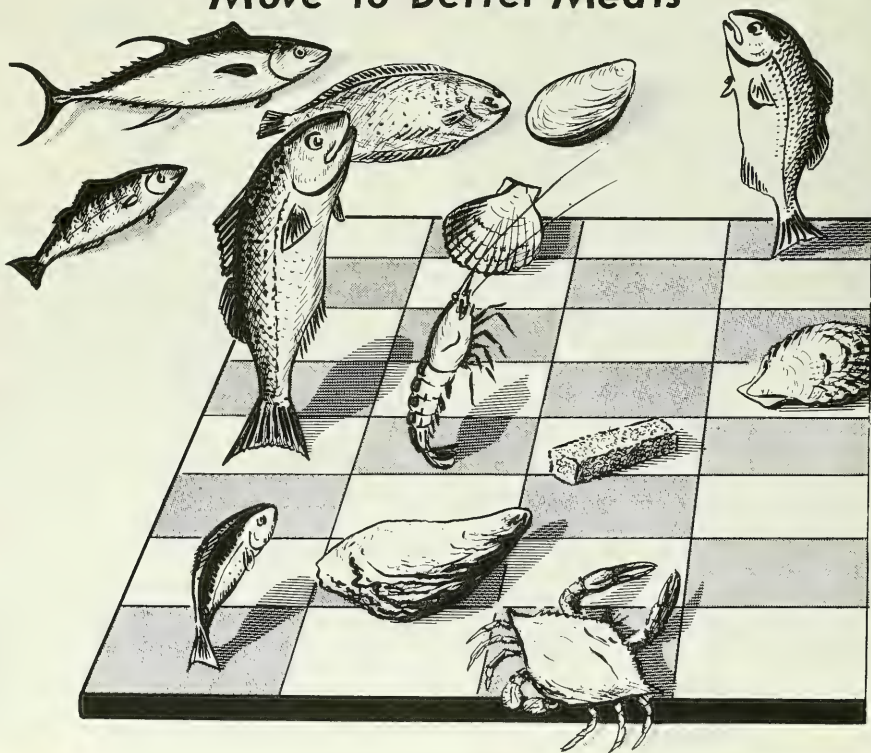
A \$70,500 EDA public works grant and a \$70,500 public works loan (20 years at $4\frac{1}{8}$ percent interest) also were made to the Makah Indian Tribe to repair and enlarge a pier at Neah Bay. The pier and adjacent land belong to the Tribe. The pier will serve the Tribe's fishing fleet, other fishermen, charter boats, and the Cape Flattery Co.'s "floating plant."

The project also will include an access road and water line to the new plant for fire

protection. Total plant cost will be \$1 million: \$650,000 EDA loan, \$50,000 Tribe investment, \$100,000 equity capital by Cape Flattery Co., and \$200,000 private capital. The plant will convert scrap fish into protein meal and oil. Twenty-four people will be employed and 8 to 10 fishing vessels will be required to supply the raw material when the plant is fully operational. Job priority will be given to Makah tribesmen. EDA also is guaranteeing 90 percent of a \$150,000 working capital loan for the Cape Flattery Co.



Move to Better Meals



BUREAU OF COMMERCIAL FISHERIES PROGRAMS

Photograph Pink Shrimp Reaction to Electricity

The "R/V George M. Bowers" returned to Pascagoula, Mississippi, on April 4 from a 21-day cruise (#76) to the Eleuthera Island area, Great Bahama Bank, to study shrimp behavior. The objective was to record with color motion picture film the escape reactions of pink shrimp stimulated by electrodes of the BCF-developed electro-shrimp trawl. Previous attempts to film their behavior patterns in front of the electric trawl on commercial shrimp grounds were unsuccessful because of poor visibility due to high turbidity. The offshore waters off Eleuthera were selected because of water clarity and the similarity between its bottom type and that of commercial shrimp grounds off south Florida.



Adult pink shrimp (*Penaeus duorarum*).

Live shrimp were transported in circulating seawater tanks on board the vessel to the work area. The shrimp were then placed in bottomless cages, which allowed the animals to burrow into the coralline-sand substrata. After the shrimp burrowed, the cages were removed and the electro-trawl was towed over the area. SCUBA divers riding a sled positioned above the electric trawl and towed by the Bowers recorded the escape reactions of the electrically stimulated shrimp with a 16 mm. movie camera. They obtained 2,000 feet of film sequences.

Burrowed Shrimp Can Be Caught

Shrimp escape reactions appeared to be similar to previous behavior observations collected on Bowers Cruises 59, 60, and 61. The shrimp escaped from the bottom between the first and second electrode of the five-electrode trawl. They jumped several inches above the bottom and exhibited lateral escape reactions. It appeared that such escape be-

havior would cause burrowed shrimp to be caught as long as the footpole tended bottom.

It also was observed that the electrodes of the electro-shrimp trawl forced large numbers of Portunid crabs out of the substrata and into the trawl.



"Delaware" Locates Yellowfin Tuna

BCF's research vessel M/V Delaware located and fished concentrations of prime-size yellowfin tuna in the Gulf Stream area of the Northwestern Atlantic during 3 weeks of longline fishing explorations (Cruise 67-2, March 10-April 5, 1967). The U. S. Naval Oceanographic Office lent technical and tactical support to determine optimum thermal environment conditions for experimental fishing (see Fig. 3). Previous investigations in this area noted good yellowfin tuna catches after mid-April; results of cruise 67-2 extend the seasonal abundance potential of the species by one month.



Fig. 1 - Yellowfin, bluefin tuna and swordfish on deck of M/V Delaware were part of a 2-ton exploratory longline catch, March 15, 1967.

Major objectives of the cruise: (1) locate tuna and swordfish concentrations based on analysis of the thermal environment structure, (2) survey seasonal distribution and abundance of tunas and swordfish in Northwestern Atlantic, (3) demonstrate availability of bluefin tuna concentrations to commercial-type longline operations, (4) evaluate applica-

tion of an expendable bathythermograph (XBT) system to obtain layer depth data for fisheries and environmental research, and (5) field test an experimental longline branchline detaching system.

Gear Used: Fishing gear consisted of 165-fathom units of longline with 10 branchlines attached at 15-fathom intervals. Each 10-hook unit was buoyed from the surface with a 5-fathom line. Squid and herring baits were alternately used on every other unit.

Experimental "auto-clips" replaced spring-type clips used to attach branchlines to the mainline. They were automatically released by a prototype detaching device at the rail (see Fig. 2). Adjunct equipment included a marine radiofacsimile recorder, an XBT system, and 2 surface-temperature recording systems.



Fig. 2 - Experimental "auto-clips" connecting branchlines to the mainline were released by a prototype detaching device. When unattended, the detached clips were caught by the semicircular steel rake shown below the detaching mechanism.

Methods of Operation: The approximate geographic position of each fishing station was selected from analyses of synoptic sea-surface temperature and sonic-layer depth charts received daily from Fleet Weather Facility, Norfolk, Virginia, via radiofacsimile. Additional synoptic sea-surface temperature data were received from special radiofac-

simile charts of ASWEPS (Antisubmarine Warfare Environmental Prediction Systems) aircraft overflights in the operations area (see Fig. 3). The aircraft used infrared radiation measurement equipment to obtain surface temperature readings for determining positions of strong horizontal gradients. The validity of these data was checked--and the exact position of each station was determined--by analyses of actual sea-surface temperature observations (recording thermographs) and subsurface temperature profiles (XBTs) taken as the vessel moved through the selected area. With the exception of one station (day set at Station 3), longline gear was set after midnight and hauled after sunrise to permit fishing during dark and light hours of the day. The effect of current on the gear (drift) was measured by plots of Loran bearings on the ends of the longline set at time of setout and haulback. XBT recordings of the subsurface temperature profile were taken at the time and position of each Loran bearing.

Results: An abundance of 82-pound average size yellowfin tuna (*Thunnus albacares*) was found at all but one station. (Station 1: 36°36' N. Lat., 72°07' W. Long.) Catch rates ranged from 1.5 to 5.5 fish per 100 hooks. Best catches were associated with surface temperatures from 69°-73° F. over a well-defined thermocline starting at depths of 15 to 30 fathoms. In these cases, Stations 2 (36°56' N. Lat., 70°44' W. Long.) and 5 (37°44' N. Lat., 69°11' W. Long.), the gear was positioned on the warm side of the north wall of the Gulf Stream in very swift current (set No. 2 drifted northeast at 4.1 knots, and set No. 3 drifted east at 4.2 knots). Similar size yellowfin have been found in this area in abundance as early as mid-April. A year ago, mid-March 1966, a few 35-pound average fish were taken in this area under similar environmental conditions. Catches from this recent cruise, however, mark the earliest known availability of yellowfin tuna abundance in the Northwestern Atlantic.

No concentrations of bluefin tuna (*Thunnus thynnus*) were located, nor was a thermal environment encountered similar to that which yielded heavy catches a year ago. The scattered catch of 8 bluefin consisted of 327-pound average fish, 50 pounds heavier than the average size in this area a year ago. It is further indication that this group of fish has frequented the region in the late winter and early spring season for 4 consecutive years.

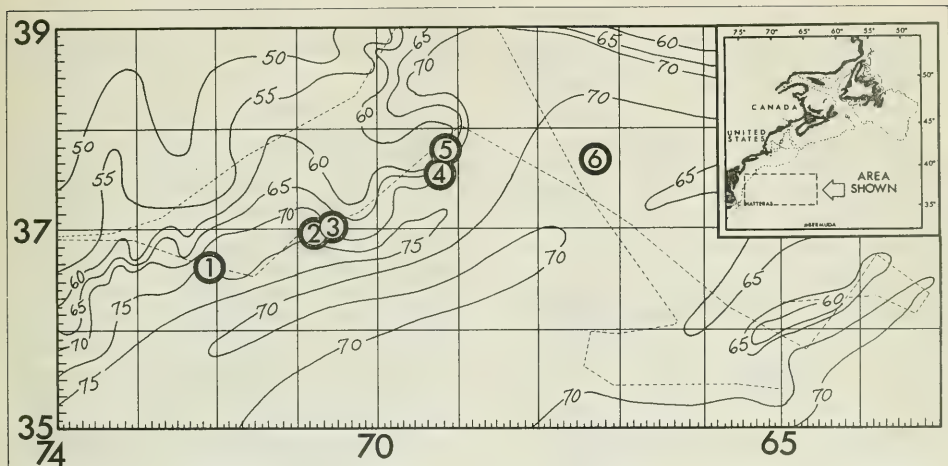


Fig. 3 - A modified example of special ASWEPs overflight charts received by radiofacsimile aboard the M/V Delaware during Cruise 67-2. Sea surface temperatures (Fahrenheit) on this chart are primarily interpreted from infrared radiation readings during the flight of March 28, 1967 (track shown by dashed line). Starting position of the Delaware's six longline stations are numbered. Observed temperatures from the vessel on March 28 and 29 (Stations 3 and 4) agree closely with the aircraft data.

Bigeye tuna (*Thunnus obesus*) were found at 3 stations and were associated with the same environmental structures as yellowfin tuna. Average weight of bigeye taken at Stations 2 and 5 (see positions on preceding page) was 109 pounds. A single, small, bigeye weighing 20 pounds was taken at Station 6 (37°40' N. Lat., 67°20' W. Long.). The only albacore (*Thunnus alalunga*) caught during the cruise was found at Station 4 (37°34' N. Lat., 69°13' W. Long.) and weighed 52 pounds.

Catches of swordfish (*Xiphias gladius*) were minimal in the environment fished. The 2 stations of capture also had the highest catches of yellowfin tuna. With the exception of one 210-pound male at Station 2, all swordfish were under 100 pounds.

Heavy shark catches were encountered at 4 stations. Shark mutilation to tunas and swordfish was not significant, although 100 hooks and considerable time were lost due to frequent snarls and parting of gear.

New Expendable XBT Tested

A newly installed expendable bathythermograph system (XBT) was tested to obtain rapid and accurate profiles of vertical thermal structure. Disregarding 3 human errors,

98.8 percent of 85 XBT operations were successful. Immediate availability of vertical temperature data from this system, combined with surface temperature data from radiofacsimile charts and recording thermographs, facilitated maneuvers of the vessel into desired thermal environments for successful fishing. Sixty-two XBTs were coded into BATHY messages and transmitted to ASWEPs on shore.

Full-scale field trials were conducted using experimental branchline "auto-clips" and a prototype rail detaching device. With very few exceptions, the only problems encountered were from branchlines snarled on the mainline. Manual operation of the clips in these cases cleared the gear as quickly as had been accomplished in previous operations. The chief advantage of the system, noted from these trials, was the continuous hauling speed attained, and the consequent easing of ship handling in high winds and moderate to rough seas.

In cooperation with other agencies, 43 tunas and 149 sharks were marked and released using dart tags. Studies on metabolic rates and heat conservation systems in live yellowfin and bigeye tunas were carried out by co-operating scientists from the Woods Hole

Oceanographic Institution. Tuna stomachs, gonads, tissue samples, and several whole specimens were preserved frozen for further analysis at BCF's Tropical Atlantic Biological Laboratory in Miami, Fla.

Operations from the Delaware were coordinated with those of the U. S. Navy Destroyer "William C. Lawe" during 5 days of acoustical experiments. A port call of 5 days was made at Gloucester, Mass., to rebunker the vessel, effect repairs, and change personnel.

Note: For further information, contact Dr. John R. Thompson, Acting Base Director, or Ernest D. McRae Jr., Exploratory Fishing and Gear Research Base, State Fish Pier, Gloucester, Mass., 01930.



"Undaunted" Explores for Tunas

The R/V Undaunted conducted Cruise 6701 through the Southern Lesser Antilles (St. Vincent area), north coast of Venezuela, southern Bahamas, Feb. 2-Mar. 7.

Its primary missions were to investigate distribution and biology of surface tunas and other pelagic predators and measure physical and biological environment--and to investigate distribution and biology of fishes suitable for use as live bait for tuna fishing. A secondary mission was to investigate physical oceanography of the area on the Atlantic side of the Antillean Arc from Martinique to Grenada.

The scientists conducted a fishery-oceanography survey with scouting for tunas during daylight hours in the St. Vincent Island area February 12-28. It was interrupted by a stop to make bait February 18-19, and a physical oceanography survey outside the Antilles Arc February 19-February 23.

North-south transects were run during the first phase, and east-west transects during the second.

No tuna schools of any substantial size were sighted on the farthest west transect (approximately 63°30' W.), and only a single sighting of large yellowfin was made on the farthest north transect (approximately 13°00' N.) in the St. Vincent area. Figure 1 shows all sightings in the area. Only one school, of 2-3 pound skipjack, would take the bait. Nonetheless, the sightings numbered 4 through 9 in table indicate a considerable resource, although nearly constant easterly winds, averaging about Force 4, make fishing difficult at this time of year. Figure 2 shows the depth of the 24° C. isotherm in the St. Vincent area; the northern part of a counterclockwise eddy apparently is present.

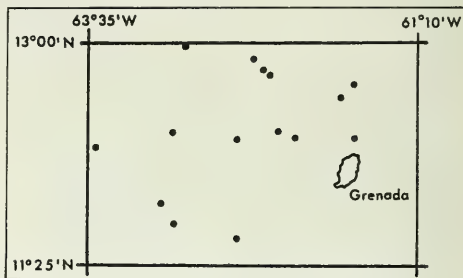


Fig. 1 - Tuna sightings in St. Vincent area.

Several sightings of tuna schools in the southern Bahama Islands and northwest of Mona Passage (Table, Nos. 1-3 and 10) suggest a resource at this season. These sightings were made while steaming and were not part of an organized survey. On the basis of sightings Nos. 2 and 3, a short fishery-oceanography survey was run between Caicos Bank and Great Inagua Island (March 3-5) but no sightings were made.

Sightings of Substantial Schools (Estimated at 5 Tons or More) of Tuna, UN 6701.

No.	Position		Date	Time (GMT)	Species	Estimated No. Tons	Remarks
	(N. Lat.)	(W. Long.)					
1.	24-17	75-11	Feb. 4	2100	Yellowfin+blackfin	10-15	2 blackfin on jig ^{1/}
2.	21-21	72-33	Feb. 5	1845	Yellowfin+skipjack	4-5	1 yellowfin, 1 skipjack on jig ^{1/}
3.	21-05	72-13	Feb. 5	2020	Skipjack+blackfin	5	4 skipjack, 16 blackfin on jig ^{1/}
4.	12-24	63-00	Feb. 15	1402	Yellowfin	50	None caught ^{1/}
5.	11-58	63-07	Feb. 15	1905	Skipjack	100	None caught ^{1/}
6.	12-23	62-27	Feb. 24	1430	Yellowfin	100+	15-50 lb. fish; would not take bait.
7.	12-24	62-13	Feb. 24	1550	Skipjack	60-70	1 on jig; would not take bait.
8.	12-21	62-05	Feb. 24	1818	Yellowfin	20+	Would not take bait.
9.	12-44	61-40	Feb. 27	2005	Yellowfin+skipjack	30-40	80-lb. fish; would not take bait.
10.	18-57	68-07	Mar. 2	1550	Skipjack	20	Caught 155 with bait; 1 on jig.

^{1/}No bait aboard.

Note: The only catch not included in this table was at 12-53, 62-25, on February 25 at 1830 GMT, when 56 small skipjack were caught on bait from an estimated 1-ton school.

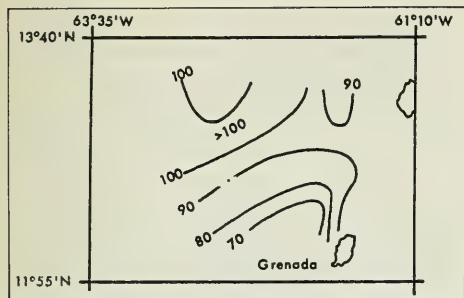


Fig. 2 - Depth in meters of the 24° C. isotherm in St. Vincent area, February 24-27.

Investigate Distribution and Biology of Bait

Although conditions at Aguadilla were nearly ideal for night baiting, very little bait was seen under the light (about 25 scoops), and this only for a short period. Local fishermen at Isla Lobos and Punta Arenas (Venezuela), where bait was purchased on previous cruises, said they had seen none in the area for several days.

Bait was finally made at the U. S. Naval Station, Trinidad. A daylight attempt was unsuccessful, but night baiting while tied to the dock was carried out without difficulty. Two hundred scoops were taken in two sets;

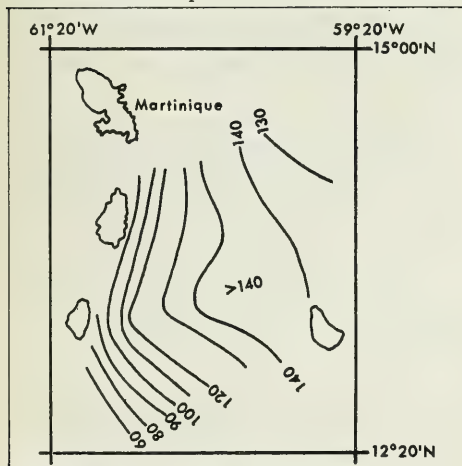


Fig. 3 - Depth in meters of the 24° C. isotherm between Barbados and the Antilles.

at least 1,000 more scoops were still under the light when operations were terminated. This fish was an anchovy (close to *Anchoviella eurystole*) which may be a previously undescribed species of *Engraulis*. Tropical Atlantic Biological Laboratory's Systematics of Fishes Program will investigate the problem further. Survival of the bait was very good; about 70 scoops were still alive on arrival in Miami.

Survey Physical Oceanography

A physical oceanography survey between the Antillean Arc and Barbados was carried out February 19-February 23. Depths of the 24° C. isotherm are shown in Figure 3. Operations were continuous through the 24 hours; tuna scouting was carried on during daylight hours. No tuna schools were spotted.

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The Undaunted sailed on its present cruise with special equipment: 25 bicycles and 8,000 used schoolbooks for the children of Cartagena, Colombia. The Colombian city was adopted as its "sister city" by Coral Gables, Florida, which is active in the "People-to-People" organization. The bikes and books were donated by the people of Miami.



Juneau Reports on Alaskan Shrimp

BCF's Juneau, Alaska, office has issued a newsletter devoted to the shrimp industry and designed to help Alaska fishermen and processors. It reviews the history of the fishery, growth of foreign activity off Alaska, and discusses "our shrimp programs in processing, locating stocks, gear development, and biological research."

The Juneau staff believes that the shrimp industry seems "ripe for an abrupt expansion." The apparent leveling off of the king crab fishing near Kodiak has stimulated interest in shrimp. It is likely that at least 20 shrimp vessels will be operating in the Kodiak area alone before the end of 1967; only 3 trawlers fished shrimp in 1965. Some estimates of shrimp potential are as high as 400 million pounds annually—over twice that for king crab. In 1966, about 25 million pounds of shrimp were landed; Kodiak was the leading port. The newsletter says: "Though we can only specu-

late, the total catches by Alaska fishermen during this current year could exceed 40 million pounds."

STRIVE TO IMPROVE QUALITY OF PROCESSED SHRIMP

Despite large resources available and high prices per pound, the shrimp industry has remained relatively underdeveloped. Why? BCF research and consultation with processors indicate that a big problem is the inferior quality of machine-peeled shrimp.



The larger pandalid species caught in the Gulf of Alaska: left, coon-stripe shrimp; right, spot shrimp; bottom, side-stripe shrimp.

The processors know that the best way to produce a top-quality product is to start with fresh, high-quality, raw shrimp. But they find that too-fresh shrimp cannot be peeled economically by machine. The shrimp break on the machine, and more labor is needed to inspect and discard partially peeled shrimp. Peeling efficiency can be improved and costs cut by holding shrimp in ice for at least 2 days before peeling. But this also creates problems because holding shrimp reduces their quality substantially. Lost are the important contributors to the original high quality: nonprotein nitrogen, sugars, free amino acids, and nucleotides. As a result, the color, flavor, odor, and texture of the finished product suffer. And pale-colored shrimp meet buyer resistance.

The first challenge to technology is: Find a technique to condition fresh shrimp for machine peeling as a substitute for holding them in ice. Experiments at BCF's Technological Laboratory at Ketchikan, Alaska, showed that

cooked shrimp tended to retain color in the peeling process. To test results under commercial production conditions, BCF technologists conducted experiments at the Harbor Seafoods plant in Wrangell to see if heat-treated shrimp could be machine peeled and their color remain bright during peeling.

Heat Put On Them

In one series of experiments, 60-pound batches of shrimp, caught only 3 to 5 hours before tests began, were cooked at different temperatures and for different periods. Then, the shrimp were processed in mechanical peelers. Higher temperatures improved color but resulted in poorer peeling; lower temperatures improved peeling but little color was retained. Two-cook sequences then were tested: 2 minutes at 110° F. to improve peeling, followed by 15 seconds at 150° F. to improve color. This double cook worked well: both color and peeling were good. The shrimp meats were canned for later color tests.

From a practical approach, the best the researchers could hope for would be to process shrimp about 24 hours after they are caught. So they allowed some shrimp to set overnight without ice at about 35° F. Then one lot was cooked 3 minutes at 110° F. and resulted in fair color and excellent peeling.

At this point, it seemed a double precook would improve color, flavor, and texture while keeping peeling characteristics similar to ice-held shrimp.

A second series of tests was conducted to determine if high- or low-temperature cook should come first--and how high a temperature could be used to get the best color and peelability. The researchers also needed to determine the yield of this technique compared to ice-held shrimp.

In each experiment, 100 pounds of shrimp held overnight in shrimp boxes without ice were used. The best results were obtained with a 15-second 165° F. first cook, and a 3-minute 110° F. second cook.

To estimate yield, 500-pound lots of shrimp were used. One lot was precooked at 165° F., followed by 110° F., before peeling. A second lot was iced normally and processed 2 days later. The yields were nearly the same, although the yield picture was complicated by formation of a gel in cans of precooked shrimp.

The researchers think shrimp quality can be improved significantly by a 2-stage heat treatment before machine peeling. The method has to be checked out in commercial scale trials. If successful, it will provide high-quality raw shrimp from the peeler that will win markets in new and conventional products.

Proper care of catches aboard vessels is of "paramount importance" in retaining quality. The staffs of BCF's Exploratory Fishing and Gear Research Base and the Ketchikan Technological Laboratory are perfecting methods of handling shrimp aboard vessels, including sorting and storing.

LOCATING AND HARVESTING SHRIMP

BCF's Exploratory Fishing and Gear Research (EF&GR) Base is headquartered in Juneau. Its staff investigates the State's marine waters and offshore waters. It defines the seasonal abundance and distribution of various fishery resources, and develops improved or new devices or methods for harvesting. BCF's "John R. Manning" is used and various fishing craft are chartered when needed.

The EF&GR shrimp program has dual purpose: to help develop a spot-shrimp fishery suitable for smaller vessels in order to alleviate the current seasonal unemployment of salmon fishermen; and to promote expansion of pink-shrimp fishery in central and western Alaska to provide jobs for men and vessels made available as king crab fishery levels off.

Currently, pink shrimp and spot shrimp interest commercial operators a great deal. Pink shrimp are most important because they are abundant and are distributed widely in Alaska waters. Spot shrimp are not as widely distributed nor as abundant as other species; however, because of their large size and high unit value, small, localized fisheries are developing in Southeast Alaska and Kachemak Bay (Cook Inlet). The EF&GR Base staff seeks to locate resources and develop improved harvesting methods; over half the base funds go into shrimp study.

Pink shrimp studies now seek to develop improved gear. Selective trawls to sort trash from catches--and modified trawls to permit fishing for various size-groups and/or species--have been constructed and will be tested this spring.

The Juneau staff believes there is need to reassess soon the shrimp stocks of the Shumagin Islands. Extensive exploratory trawling there in 1964 revealed the greatest concentrations of pinks of any area during a 4-year study. This was attested by foreign fleets operating there continuously since spring 1965. "There is no doubt that this fishing has had some effect on the abundance of these shrimp stocks." The Alaska fishing industry--presently faced with reduced catches of king crab in the Kodiak area--is turning to the shrimp resource. The Shumagin reassessment would provide industry with current information. It is the logical area for U. S. fishery expansion.

Spot shrimp or "prawns" have been part of the personal-use fishery for many years in Southeast Alaska, but only occasionally have they been taken commercially. During fall 1965, BCF began to investigate the resource to develop an off-season fishery for idle small boats of gillnet, troll, seine, and halibut fisheries. Gear development and exploratory fishing were equally important during this first year's study. As investigations continue, major emphasis will be on exploratory fishing but modification and refinement of gear and fishing methods will continue to receive attention.

As a result of BCF's preliminary work, a small pot fishery has started in Southeast Alaska, and limited numbers of these large shrimp are being marketed in the "lower 48" (the U. S.). Thus far, the fishery has used pots only. However, EF&GR recently constructed several small (35 ft.), modified, beam trawls that will be tested in late spring in areas of known spot-shrimp abundance. These trawls are designed for small boats (30 to 35 ft.), can be handled by one man, and are relatively inexpensive to build. Their compact size is easily controllable and they may prove entirely suitable for the restricted Southeast Alaska grounds where short tows and abrupt turns would effectively prohibit the use of more cumbersome otter trawls.

Exploratory fishing operations are being resumed this spring and will continue next fall and winter. The goal of spot-shrimp surveys is to assess the potential of all waters inside Southeast Alaska, using both pots and trawls.

BIOLOGICAL RESEARCH

Biological research on commercial species of Alaskan shrimp is an important part of the BCF program. Because of imminent expansion of fishing effort, the staff now is studying life histories, behavior, and means of determining abundance of shrimp stocks. This information will assist industry and management--and guarantee the resource's future.

One primary goal is to learn the life histories of the 4 commercially important Alaska species: sidestripe, pink, spot, and coonstripe. For all 4 species, generally, the eggs hatch in the spring, the young shrimp begin life as larvae, which float and swim about in the plankton while molting and changing shape several times. In their first summer, they change into adults; for the remainder of their life they live on or near the ocean bottom. All shrimp begin life as males and breed as males for 1 or 2 years. Then, they change into females and reproduce at least one time. They spawn in the fall. The female carries the fertilized eggs on the underside of her abdomen until spring, when the eggs hatch.

BCF has research station for shellfish investigations at Kasitsna Bay to study shrimp and king crab in central Alaska. Most field work involves early life and adult stages. The 38-foot "R/V Sablefish" and most research sampling equipment and supplies are there.

Emphasis is placed on learning to identify the larval stages of the four species. This is done by rearing known species in the lab and using the larvae as examples to determine the species of larvae captured during sampling at Kasitsna Bay and Auke Bay. It is important to be able to identify larval forms of each species and understand their later life histories--because, when the commercial fishery begins to harvest the shrimp, BCF will be asked to predict population abundance 1 and 2 years in advance. If the researchers know the abundance of juvenile forms, and their rate of growth, such predictions may be possible.

The 4-year-old study of adult shrimp has had several objectives. A marking technique has been developed for staining Alaska shrimp. These techniques will be put into practice when a suitable method of identifying marked animals in commercial landings is developed. With the present method of fishing and proc-

essing, individual marked shrimp cannot be detected easily. A good idea of the percentage of marked animals captured is needed to calculate abundance of various stocks. The researchers also are studying changes in abundance of adult shrimp in several areas in Kachemak Bay. Results indicate seasonal migrations will affect the commercial harvest from month to month. When these migrations are understood, the scientists will be able to advise fishermen of times and areas where heavy concentrations are likely to be found.

The adult-shrimp study also involves research on environment, food habits, and activities of shrimp. In shallow waters, divers equipped with SCUBA have observed the activities of shrimp in their natural environment. By using surface-to-bottom strings of pots, the scientists have learned that shrimp move off the bottom during nighttime hours and stratify by size groups--smaller shrimp nearer the surface. Bottom trawling experiments have shown that fewer but larger shrimp could be captured by night fishing. Basic information on shrimp behavior provided by BCF biologists is used by EF&GR staff to perfect fishing techniques.

The Alaska Department of Fish and Game is studying the life history of shrimp of Southeastern Alaska. This work is supported by Federal funds. Headquartered at Wrangell, this project provides data on species composition, size, and sex composition of the commercial catch. The observations are supplemented by year-round sampling with small-mesh otter trawls to learn distribution, abundance, and growth rates of juveniles that escape commercial gear.



Stanford Lab Cuts Cost of Ocean Data

On March 13, 1967, the "SS Californian" of the Matson Navigation Co. began using radio teletype (RATT) to transmit automatically digitized temperature-depth data to shore. It was the most recent development in the pilot project of BCF's Biological Laboratory in Stanford, Calif., to demonstrate the feasibility of obtaining ocean monitoring data at low cost by using expendable bathythermograph (XBT) systems aboard merchant and fishing vessels.

The Stanford lab is analyzing the data for seasonal variation of temperature and flow in the California Current. Such studies are essential to BCF's efforts to develop fisheries forecasting capability. The project is an outstanding example of industry cooperation with Government--in this case, Matson with BCF and the Navy. The XBT system was placed aboard Matson bulk cargo and container vessel, SS Californian. About twice a month since June 1966, the ship's personnel have made observations at approximately 100 nautical mile intervals along the great circle track from Honolulu to San Francisco. The subsurface temperature observations can be obtained without slowing the ship's speed, which is necessary unless the expendable instrumentation is used.

Rapid Transmission of Data to Shore

Prompt relay of observed data to shore plays an essential role in environmental monitoring to provide weather, oceanic, and fishing advisories by radio to fishing vessels. Radio station WWD, licensed to BCF Tuna Resources Laboratory and operated with cooperation of Scripps Institution of Oceanography, helps develop communication capabilities and receives RATT transmissions. WWD is a prototype station for a network to provide an ocean data service. It is rapidly improving its capabilities for scientific communication service to fishing vessels, research ships, and merchant ships that cooperate in providing scientific data.

The project is a prime example of Government-industry cooperation to save much money. The idea of using ships of opportunity was generated at the Stanford lab. But the project could not have got underway without the expendable instrumentation developed by Sippican Corporation, the platform and cooperative personnel to make observations provided by Matson, financial support from the Oceanometrics Program of the Navy Electronics Laboratory, and encouragement and technical assistance from the Fleet Numerical Weather Facility.

To illustrate the relative economy of using ships of opportunity, it is estimated that annual operating costs to obtain 4 sections per month, using the SS Californian, would be about \$40,000. This excludes costs of communication but includes preliminary reduction of data. If it were necessary to charter a suitable, inexpensive, but slower, vessel

to collect equivalent data, the annual operating cost would be about \$500,000.



BCF Aquanauts Train for SeaLab III

BCF will participate in SeaLab III, a Navy experiment designed to enable man to learn to live and work on the ocean floor for extended periods. SeaLab III is scheduled for the winter of 1967 and will be the third in a series of experiments in undersea living of the Navy's Man-in-the-Sea Program. Five teams of Navy divers and civilian scientists will operate from a submerged laboratory at 430 feet off Southern California. They will perform engineering and scientific work over a 60-day period.

Three BCF scientists are participating: Richard A. Waller, Division of Biological Research, the BCF Project Chief; Richard A. Cooper, Boothbay Harbor Biological Laboratory; and James M. Scott, La Jolla Tuna Resources Laboratory.

Some biological studies to be carried out during the experiment are: animal transplants, animal tagging studies, observations on animal behavior, environmental monitoring, and time-series biological studies with elapsed-time cameras.

Will Use Artificial Breathing Gases

During SeaLab III, the undersea laboratory will be pressurized to the prevailing depth of about 430 feet so that personnel will have free access to the outside environment. At this high pressure, it will be necessary to breathe a synthetic gas mixture of oxygen and helium because compressed air cannot be used by divers below about 300 feet. The concept of divers using artificial breathing gases under extreme high pressures is a recent development; it is called "saturated diving". Before the technique was worked out, the depth and duration of dives were critically limited, and undersea living experiments were not feasible.

In one phase of the training requirements, Richard Waller completed an 8-day simulated dive in a pressure chamber at the Navy's Experimental Diving Unit in Washington, D. C. He was subjected to pressures up to 215 lbs. psi (equipment to water pressure at 450 feet)

and artificial breathing mixtures of helium and oxygen. Richard Cooper completed the 450-foot test in April. Michael Scott will undertake this phase of the training during the summer. The simulated saturation dives are required of all "aquanauts" to determine their tolerance of the high pressures and synthetic breathing gases to be used in SeaLab III.



Retail Clinics Help Industry

BCF marketing personnel are working to make the fishing industry more competitive with other industries by improving merchandising practices. They are conducting seafood retail merchandising clinics on a pilot basis for meat cutters and seafood counter-men in selected areas.

The clinics are two 3-hour sessions that emphasize purchasing, handling and thawing techniques, cutting, display ideas, and the basic economics of retailing and pricing seafoods.

Associated Grocers reported to BCF that in its 8 stores in the area of Olympia, Washington, sales of fresh fish had averaged 300 pounds per week per store for 3 years. After the new merchandising program was started, sales soared to a 1,100-pound average.



To Sell Fishery Products Retail at Fairs

BCF is adding yet another approach to its promotion of foreign trade. When it introduces new fishery products into European markets, it will hire a professional U. S. food merchandiser to sell the products at retail prices at the fair sites. To help defray the cost of the operation, 25 percent of the receipts will be taken from the retail sale of each product; the remainder will be given to the participating U. S. firms.

The new approach will be tried at 3 fairs in fall 1967--Dublin, Ireland; Leeds, England; and Dijon, France. Only products new to these areas will be eligible.



Fur Seal Prices Mostly Lower

At the Fouke Fur Co.'s spring auction in Greenville, S. C., April 6-7, 20,700 Alaska fur sealskins were sold for the account of the U. S. Prices for blacks, Kitovis, and Lakodas declined from the record high sale of a year earlier and the fall sale of October 1966.

Blacks averaged about \$90, down 20 percent; Kitovis averaged about \$77, down 11.5 percent; and Mataras \$93, unchanged. Natural Lakoda skins were virtually unchanged at average \$67; dyed Lakodas averaged about \$27, down 35 percent from last fall.



BCF Films in "Oscar" Test

The U. S. Information Agency has selected 13 Government films, including BCF's "Flavor of Maine" and "Watermen of Chesapeake," to represent the U. S. in competition for the CINE (Council on International Nontheatrical Events) Golden Eagle Award. This is the first time Government-produced films have been permitted in the competition.

CINE is a voluntary, nonprofit organization set up to coordinate the selection of U.S. nontheatrical, short subject, and TV documentaries for competition in overseas film festivals.



New Book's Message: "Let's Cook Fish"

BCF has produced a 52-page color publication--"Let's Cook Fish"--to serve as a complete guide to basic fish cookery. It includes information on buying, handling, storing, and preparing fish. It seeks to arouse more interest in fish as an everyday food by emphasizing variety, economy, and nutritional value.

"Let's Cook Fish" can be bought from the Superintendent of Documents, Washington, D. C., for 60 cents.

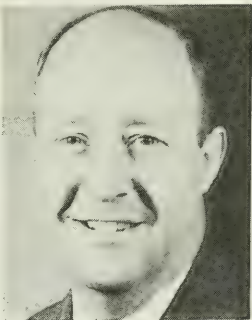


Crowther and McHugh Named Director and Deputy Director

The Department of the Interior has named H. E. Crowther director and Dr. J. L. McHugh deputy director of BCF. They had been serving in acting capacities. Mr. Crowther was deputy director before becoming acting director Nov. 1, 1966. Dr. McHugh was assistant director for biological research until Nov. 3, 1966, when he was appointed acting deputy director.

"Both men have 30 years' experience in fishery research and administration and are eminently qualified to head the Bureau," Secretary of the Interior Stewart L. Udall said at the swearing-in ceremony May 2.

Born in Laurel, Maryland, Mr. Crowther received his BA in 1933 and his MS in 1935 from the University of Maryland. In 1936, he was employed by a private company to conduct research on fishery products. In 1943, he joined the Marine Corps and served as an officer in the South Pacific. From 1946 to 1949, and from 1953 to



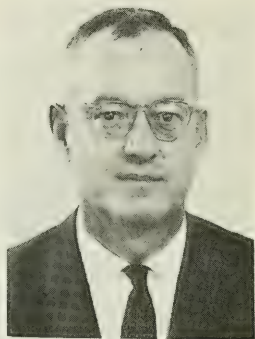
Harold E. Crowther

1956, he was employed in the fishing industry in Massachusetts. At first, he was a research scientist, and later an executive. In 1949, he entered Government service. For 4 years he served as Chief, Exploratory Fishing Section, and Chief, Technology Section, Fish and Wildlife Service. He came back to the Fish and Wildlife Service in April 1956 as BCF's Coordinator of the Saltonstall-Kennedy Program. In November 1957, he was promoted to Chief, Division of Industrial Research and Services; in June 1961, he became Assistant Director (now Deputy Director).

In 1961, President Eisenhower appointed him a U. S. Commissioner of the International Pacific Halibut Commission and he continues to serve in that capacity. He has served too in international fisheries conferences.

For 8 years before coming to BCF in 1959, Dr. McHugh was Director of the Virginia Fisheries Laboratory and Professor of Marine Biology at the College of William and Mary, Williamsburg, Va.

He was born in Vancouver, B. C., and received his bachelor's and master's degrees from the University of British Columbia. He served the Biological Staff of Canada's Fisheries Research Board from 1938 until 1941. During World War II, he was an infantry officer with the Canadian Army in England and France.



Dr. J. L. McHugh

After earning his doctor of philosophy degree at the University of California's Scripps Institution of Oceanography, Dr. McHugh moved to Virginia to head the State's marine fishery program at Gloucester Point. He became a United States citizen in 1958.

He is the author of 70 publications on fishery biology, ichthyology, and biological oceanography, a member of scientific societies, and a trustee of the International Oceanographic Foundation. He has been a member of many United States delegations to international fishery meetings in Europe, Latin America, and the Far East.



Develop Fish Food in Ice Cubes

Biologists of BCF's Ann Arbor (Michigan) laboratory have developed a unique method of feeding plankton to alewives, smelt, and coregonids (whitefish) in experimental aquaria. They freeze wild zooplankton in small ice cubes. When the cubes are placed in a tank, they float and gradually melt--releasing the animals. As the animals drift toward the bottom, they are taken readily by the fish.



INTERNATIONAL

FAO Caribbean Project Issues Report No. 1

The UN's FAO Caribbean Fishery Development Project vessels "Alcyon" (Jamaica) and "Calamar" (Barbados) carried out experimental fishing for pelagic fishes using the long-line method December 1966-February 1967. Its first cruise report says that the fishing was not productive when viewed against a commercial potential. The best single day's catch (excluding sharks) was 1,000 pounds. However, in assessing catches, certain factors should be considered: the inexperience of crew and trainees; the amount of gear set out never exceeded 75 and averaged 55 baskets--only 15 percent of gear set by Japanese crews for one day's fishing; the early winter season is not particularly good for taking large pelagic species in the Caribbean. But, the report notes, no fishing time was lost, although moderate to strong breezes prevailed.

The area investigated included the Caribbean Sea; west of Cayman Islands; south to the Netherlands Antilles (Curacao Area); and east to the Windward Islands. In the adjacent North Atlantic, fishing was conducted south and east of Barbados and north of Haiti and Dominican Republic.

The long-line gear used has a "basket" (one unit) composed of 7 mainline sections each 30 fathoms long. Five or 6 branchlines were attached to the mainline and these, including the "sekiyama" and leader, measure 12.5 fathoms. This gear was suspended from surface floats by buoy lines 12 fathoms long. The gear fished a depth of 40 to 60 fathoms.

Typically, up to 75 baskets of gear were set out in early morning and retrieval began about midday. The Calamar made one night set. The hooks were baited with either herring (*Clupea harengus*) or flying fish (*Hirundichthys affinis*).

Tuna Information Obtained

Information on distribution and abundance of tunas and spearfishes resulted from the fishing. Although overall catch rate (fish per 100 hooks) was low, the number of spearfishes

taken was surprisingly high. The Calamar, working generally to the south and east of the Alcyon, took more white marlin than any other species. These catches apparently indicate concentrations of white marlin off the north coast of South America during winter. Some of these were tagged and released in cooperation with the Woods Hole Oceanographic Institute. Blue marlin were more abundant in the Alcyon's catches.

The crews also made observations of oceanographic features, including temperature and salinity to 150 fathoms. (UNDP/FAO, Project Headquarters, Barbados, West Indies, March 10, 1967.)



International Convention for Fishing in the Northwest Atlantic

ROMANIA TO JOIN

The Romanian State Council, by Decree No. 34 published in the Official Bulletin of January 30, 1967, approved Romania's adherence to the International Convention for Fishing in the Northwest Atlantic (ICNAF). The State Council Act provides the necessary authority for Romania to complete the act of adherence. However, she will not be a member of ICNAF until "a note of adherence" is received by the ICNAF Depositary Government, the United States. The note is expected in the near future.

Romania purchased 2 large factory stern trawlers from Japan in 1963 and began fishing on Georges Bank in 1965. In 1966, one stern trawler operated off southeastern Georges Bank from June through early October (4½ months).



Denmark and Norway Study Mutual Landing Rights

The Norwegian Fisheries Department is considering the question of reciprocal landing

rights between Denmark and Norway and has arranged meetings with Norwegian fisheries associations to discuss it. No formal approach to Danish authorities has yet been made. ("Vestkysten," Feb. 21, 1967.)



Talks on Asian Fishery Center Held in Bangkok

The working party to establish the fishery development center in Thailand, designated by the Southeast Asia Economic Development Conference in Tokyo, December 1966, met in Bangkok on March 13, the Japanese Foreign Office announced.

It discussed Japan's proposal to give priority to training in fishery techniques over other programs designed to develop southeast Asia fisheries.

Japan, Thailand, South Vietnam, Indonesia, and Singapore were expected to be represented. The attendance of several other Asian countries, including the Philippines and Malaysia, was doubtful. ("Suisan Keizai Shimbun," March 7, 1967.)



Fish Meal

FEO'S 1966 PRODUCTION AND EXPORTS WENT UP

The exports of member countries of the Fish Meal Exporters' Organization (FEO), which account for about 90 percent of world exports of fish meal, rose from 2,012,000 metric tons in 1965 to 2,148,000 in 1966. The FEO countries are Chile, Angola, Iceland, Norway, Peru, and South Africa/South-West Africa.

Country	Jan.-Dec.	
	1966	1965
	. (1,000 Metric Tons)	
Chile	185.9	63.7
Angola	53.6	49.2
Iceland	172.7	146.2
Norway	266.4	268.2
Peru	1,304.5	1,260.0
So. Africa (including S.-W. Africa) . .	165.6	224.9
Total	2,148.7	2,012.2

The 1966 production of FEO countries was:

Country	Dec.		Jan.-Dec.	
	1966	1965	1966	1965
	. . . . (1,000 Metric Tons). . . .			
Chile	3.9	15.9	194.2	70.3
Angola	5.0	7.1	54.7	47.7
Iceland	18.6	20.7	181.8	172.1
Norway	2.1	4.2	421.7	309.2
Peru	187.3	213.8	1,470.5	1,282.0
So. Africa (including S.-W. Africa)	1.7	1.2	257.6	272.0
Total	218.6	262.9	2,580.5	2,153.3



Convention Drafted on North Atlantic Fisheries Conduct

Representatives of 18 countries that fish the North Atlantic (the U. S., Canada, and 16 European nations) have adopted and referred to their governments for approval a Convention on the Conduct of Fishing Operations in the North Atlantic. The 18 have participated in a Fisheries Policies Conference, which met in London 4 times starting in 1965.

The Convention establishes an international code of conduct for fishing vessels and ancillary craft. It is designed to increase safety at sea, particularly on international fishing grounds, and to reduce risk of damage to boats and fishing gear when vessels using different fishing methods operate close to each other.

It contains provisions for marking vessels to ensure identification at sea. It establishes uniform supplementary light signals. It sets up uniform methods of marking nets and other gear in the sea--and a code of good conduct on fishing grounds. Further, the Convention provides conciliation procedure to facilitate settlement of small claims arising out of gear damage involving fishermen of different nations; also, an inspection system whereby authorized officers from participating countries will be able to board and inspect fishing vessels in certain circumstances for possible violations of rules or damage. It will be possible for certain countries to "opt out" of the boarding provisions, but other aspects of the inspection system--e.g., observation and reporting of violations to the authorities of the fishing vessel's flag state--will apply uniformly to all.

The Convention itself will be open for signature in London June 1-November 30, 1967. Then it will be subject to ratification by the U. S. upon advice and consent of the Senate.

The 18 Conference Countries

The countries represented were: Belgium, Canada, Denmark, France, Federal Republic of Germany, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Spain, Sweden, USSR, United Kingdom, and the U. S.

The conference stemmed from the European Fisheries Conference of 1963/64. A resolution was passed then that the United Kingdom convene a technical conference of all countries in the North-East Atlantic fisheries to draft a modern code of fishing conduct. It also was resolved to invite representatives of the U. S. and Canada to attend so that extension of convention provisions to the North-West Atlantic fisheries might be considered. The Convention will cover the area off the coasts of Canada and the U. S. as far south as Cape Hatteras, where many nations fish.

Representatives of State and Interior Department and the U. S. Coast Guard met several times with representatives of fishermen along the Atlantic coast to prepare for negotiating the Convention.

The U. S. delegation consisted of John T. Gharrett, Regional Director, BCF, Gloucester, Mass., Chairman, and Raymond T. Yingling, State Department, Vice-Chairman. William L. Sullivan Jr. of State was a delegation member. Lt. Comdr. C. J. Blondin, U.S. Coast Guard, and John B. Skerry, BCF, were advisers. (U. S. Department of State, March 21, 1967.)



Inter-American Tropical Tuna Commission

**RECOMMENDS 84,500-TON
YELLOWFIN QUOTA**

On April 6, the Inter-American Tropical Tuna Commission recommended that nations harvesting yellowfin tuna in the eastern Pacific set up a catch limit (quota) of 84,500 short tons for calendar year 1967.



GATT Reports on European Market for Shrimp

The GATT International Trade Centre, designed to help developing nations promote their export trade, has released a study of "Major Markets for Shrimp and Prawns in Western Europe." GATT is the General Agreement on Tariffs and Trade. The study is available in English, French, and Spanish editions from the Information and Library Service, GATT secretariat, Villa Le Bocage, Palais des Nations, 1211 Geneva 10; price US\$5.00.

The study stresses that continued expansion of U. S. demand is crucial to existing shrimp industries of developing countries; also, many of these countries have abundant shrimp stocks, and they must realize their export potential by stimulating demand in high-income European markets. The GATT analysis of selected European markets aims to acquaint the shrimp industry of the developing countries with recent developments in production, consumption, trade, prices, pattern of marketing and distribution channels in the United Kingdom, France, West Germany, and Switzerland.

Reports Revolutionary Changes

The report focuses on revolutionary changes in food distribution, consumption, and the remarkable advance of frozen foods. It encourages the promotion of seafood specialties, such as shrimp and prawn. It deals with such critical aspects of shrimp marketing as standards of sanitation, quality control, and improved methods of production.

The study contains conventional market indicators to help processors/exporters in developing countries pursue trading opportunities that exist or may develop. And it suggests, based on the U. S. shrimp bonanza, joint action through a European Shrimp Council to promote shrimp consumption. (GATT, Mar. 16, 1967.)



FOREIGN

CANADA

1966 LANDINGS AND VALUE ROSE

Canadian fishery landings (including Newfoundland) totaled 2.5 billion pounds in 1966 with an exvessel value of C\$153 million, as against 2.3 billion pounds at C\$142 million in 1965. Over half the 1966 value was accounted for by three species: salmon, cod, and lobster.

Canadian Landings of Principal Species, 1965-1966				
Species	1966	1965	1966	1965
	Landings		Value	
	.. (1,000 Lbs.) ..		.. (1,000 C\$) ..	
Atlantic Coast:				
Cod	561,201	575,439	24,654	23,641
Haddock	113,106	92,579	8,040	6,045
Pollock	34,589	51,456	1,379	1,869
Flounder and sole	232,312	201,647	7,707	6,462
Herring	550,835	405,460	6,215	4,249
Swordfish	6,890	7,807	2,976	3,254
Lobsters	37,210	40,524	20,827	26,636
Scallops	18,259	19,709	7,454	10,847
Pacific Coast:				
Halibut	31,470	32,973	11,282	11,112
Herring	305,783	444,063	5,570	6,232
Salmon	153,237	90,192	32,551	25,958

The 1966 season was marked by a good salmon catch in British Columbia and the buildup of the Atlantic herring fishery. On the other hand, Pacific herring landings were down sharply. Lobster landings also were down. East Coast groundfish landings of 1.2 million pounds were up about 9 percent from 1965 due to heavier landings of ocean perch, haddock, and flounder. ("Monthly Review of Canadian Fishery Statistics.")

* * *

SURVEYS MANPOWER OF DEEPSEA FISHERY

Canada's Department of Fisheries is conducting a manpower survey of the deepsea fishery off the Atlantic Coast "to obtain essential information about offshore fishermen, their training for their occupation, and to determine the general attitude of fishermen toward their livelihood." The study is being carried out by the Department's Economics Services to provide answers to questions asked by industry, the Federal-Provincial

Atlantic Fisheries Committee, and other agencies.

The confidential economic and sociological study includes the manpower situation of vessel owners and fish-processing companies. It focuses on vessels of over 100 gross tons. It will produce data on categories of labor on offshore boats and shore plants, their skills and how they learned them, and the future needs for fishermen and plant workers and the training they will need. A major survey purpose is to get the necessary information to project requirements to 1975.

Questions for Owners and Workers

Two questionnaires are being used. One is for vessel (or plant) owners and operators, the other for individual fishermen. Crewmen are asked about work and life at sea, the types of boats or jobs they prefer, and their years of experience.

Vessel and plant operators are asked more technical questions about requirements at sea and ashore--e.g., incentive measures to encourage recruitment and hold on to good personnel. They can comment generally on offshore fisheries and their problems.

The Department of Fisheries points out that the survey seeks solely to assess properly the needs of the offshore industry. To aid those in the industry, it says, it needs to know the manpower and training requirements for today and for the future. ("Fisheries of Canada," March 1967.)

* * *

WEST COAST HERRING MEAL OUTPUT DECLINES IN 1966/1967

British Columbia herring meal production for the 1966/67 season was only 23,356 short tons--down 27 percent from 1965/66 and 46 percent from 1964/65. An official of the Canadian Federal Department of Fisheries blamed "environmental" factors, not overfishing, for the herring catch decline. He also discounted the effects on herring of Soviet fishing off British Columbia--only for Pacific ocean perch.

Canada (Contd.):

In January 1967, some British Columbia herring grounds were closed for the season to protect spawning herring. Then, on Feb. 5, a 2-week ban on all herring fishing was imposed. The closure was supported by both labor and management associations. They also called for an increase in the net mesh to 1½ inches over a 5-year period. (U. S. Consul, Vancouver, Feb. 14, 1967, and Canadian Department of Fisheries, Mar. 9, 1967.)

* * *

SCOTTISH SEINE SCORES HIGH
IN FISHING TEST

The advantages of Scottish seine-netting over other methods for catching certain groundfish were demonstrated in Atlantic coastal waters during the winter by the "Guiding Star." Many fishermen are convinced. One vessel, designed exclusively for this technique, is under construction.

The Scottish vessel (and crew) was chartered last October for a year by the Industrial Development Service of the Canadian Federal Department of Fisheries.

The first 5 months were very successful, particularly off Nova Scotia. Fishing on the same grounds as the Danish-type seiners of the Atlantic Provinces, the Guiding Star repeatedly caught twice, sometimes 3 times, as much as the Canadian vessels. On one good day, in 5 tows off Cheticamp, Nova Scotia, she landed 19,000 pounds of fish--mostly cod, haddock, and flounder. Before going to Nova Scotia, she took so many fish off Newfoundland in one tow that the net burst.

Scottish Technique Effective

One advantage of Scottish seine-netting is the relatively low horsepower needed. The 73-foot Guiding Star is powered by a 152-hp. diesel engine. Her success demonstrates that many vessels, such as long-liners with insufficient power for trawling, can use the Scottish technique effectively and economically.

The Guiding Star carries two sizes of nets, the 420 and 520 Vinge trawls, which have a much higher vertical opening than

conventional nets now used in Canada. They are the main reason for the large hauls of demersal fish. The deck layout and machinery allow fast hauling and shooting. Electronic equipment is used to locate and remain with schools of fish on suitable bottom.

The vessel is now moving from port to port along the Nova Scotia coast, from Cheticamp to the western part. Later, the spring and summer 1967, she will fish from New Brunswick, Prince Edward Island, Quebec, and then return to Newfoundland. (Canadian Department of Fisheries, Ottawa, March 7, 1967.)

* * *

EXTENDS FISHERIES INSURANCE
PROGRAM TO ONTARIO

The Canadian Federal program that offers protection to fishermen for partial or total loss of vessels, fixed gear, and shore installations became effective in Ontario on April 1. Known as the Fishermen's Indemnity Plan, it already covers the Maritimes, Newfoundland, Quebec, and British Columbia.

Under the plan, Ontario owners of vessels, fixed fishing gear (traps, etc.), and shore installations having an appraised value of up to \$15,000 may obtain insurance coverage with a premium of one percent of the appraised value. Losses due to storms, ice, fire, and other recognized perils are covered. The owner recovers 60 percent of the appraised value for total loss, and a lesser indemnity for partial loss. (Canadian Department of Fisheries, Ottawa, March 29, 1967.)

* * *

FISHERIES TRADE MISSION
VISITS EASTERN EUROPE

A 4-man Canadian trade mission started a two-week tour of Europe on February 20 seeking markets for fish, according to a Canadian newspaper. The mission was particularly interested in selling frozen fillets and blocks. Its itinerary included Czechoslovakia, Romania, Hungary, and Yugoslavia. (U. S. Consul, St. John's, Feb. 27, 1967.)



LATIN AMERICA

Peru

SETS QUARTERLY EXPORT QUOTAS OF FISH MEAL

Peruvian export allocations of fish meal for the second quarter of 1967 are:

Country	Allocation
	Metric Tons
United States	No limit
Western Europe (except West Germany)	175,000
Eastern Europe	65,000
West Germany	60,000
Latin America	32,000
Asia-Australia	20,000
Total	352,000

Fish meal prices on world markets continue to decline. On March 21, Peruvian fish meal, f.o.b. Callao, was US\$100 a metric ton for shipments to U. S. ports, and US\$112 a ton for shipments to European ports. (In late February, prices were \$115 or less for U. S. ports and \$120 a ton for European ports.) Production during the 1966/67 fishing season is expected to reach 1.6 million metric tons, despite a 6-week strike and a 4-week closed season (February 15-March 14). The Government is expected to announce soon the allowable catch of anchovy for the season--it may exceed 8 million tons--and the closure date (expected in June). (U. S. Embassy, Lima, March 23, 1967.)

* * *

PRESIDENT MEETS WITH FISH MEAL PRODUCERS

Over 100 fish meal producers met with President Belaunde on March 16, 1967, to express their views on the "crisis" of the fish reduction industry. The President recognized its gravity and promised an exhaustive study. Five members of the Interministerial Commission (Ministers of Agriculture, Development, Finance, Labor, and Navy) attended. As their part of the bargain, the producers reportedly agreed not to close their plants and "lock out" the workers, as the local press headlined.

The Federation of Peruvian Fishermen, a trade union, said that it would ask the Gov-

ernment to take over operation of the plants, if the industry close them. It denied that high wages were a cause of the crisis. According to a spokesman of the National Fisheries Society, the trade association of producers, 35 plants out of 154 have gone bankrupt already because of high costs and excessive taxes. There are reputed to be \$13 of "hidden taxes" per ton, which producers object to strongly. The spokesman said that if the crisis was not solved quickly, the remaining plants would also go bankrupt or fall into foreign hands, "as is occurring already."

Meeting Resulted from Fisheries Society Proposals

The meeting with the President resulted from a heated assembly of the National Fisheries Society on March 14. Several motions were passed over the protests of a stubborn minority. The motions: (1) request the Government to close all plants temporarily; (2) obtain recognition by the Government that the industry is suffering a grave crisis; (3) ask to see President Belaunde to explain the industry's position; (4) obtain equitable tax treatment for the industry; and (5) continue talks with the Interministerial Commission and the congressional committee that also are studying the situation.

Fishing, suspended for a month at the recommendation of the "Instituto del Mar" to allow the "peladilla" to mature into anchoveta, reopened March 15. The plants had been reported processing up to 80 percent "peladilla," or immature fish, which substantially increases costs. Catching or processing "peladilla" is prohibited by a 1958 supreme decree which, apparently, has not been enforced. In any case, stocks of fish meal were reported to exceed 550,000 metric tons as of mid-March, while prices continued to drop. (U. S. Embassy, Lima, March 17, 1967.)



Mexico

RELEASES FIRST 1966 FISHERIES DATA

The 1966 production of the Mexican fishing industry continued the slow but steady increase of the last several years, preliminary data of the Secretariat of Industry and Commerce reveal.

Mexico (Contd.):

Landings of edible fish and shellfish reached a record 171,504 metric tons, compared to the previous high of 161,474 tons in 1965. All weights are "as landed"; i.e., heads-on, heads-off, cleaned, round. This is an increase of 6.2 percent, somewhat greater than previous increases.

Most important species of food fish showed good gains. Shrimp, by far the most important, reversed its recent downward trend. Landings were 39,743 metric tons, 11.7 percent better than 1965--but that was the poorest year since 1958. The anchovy is rapidly becoming an important species, and the 1966 catch of 13,748 tons is a record. Sierra mackerel, giant sea bass, and spiny lobster catches were records. The No. 2 species, oyster, reached a production of 19,921 tons, down 12.7 percent from the 1965 record of 22,818 tons. Sardines, mackerel, and abalone catches also declined.

Record Production of Industrial Fishery Items

Production of industrial fishery items was also at an all-time high. The harvest of giant kelp returned to the 1963-64 level after a slump in 1965. Production in 1966 was 22,211 metric tons, up 37.4 percent from 1965's low of 16,169 tons.

The slowly growing fish meal industry broke all records with a production of 9,602 metric tons, up 35.2 percent from 1965's record of 7,104 tons.

The combination of a small increase in shrimp catch and a large advance in prices pushed the value of 1966 shrimp to 656.8 million pesos (\$52.5 million), the highest level since 1963 and up 19.1 percent over 1965. As a result, shrimp resumed fourth place among all exports--overtook corn and trailing only cotton, coffee, and sugar. (U. S. Embassy, Mexico, March 15, 1967)

* * *

1966 CATCH ROSE IN
YUCATAN AND QUINTANA ROO

In 1966, the fishery catch of the Mexican State of Yucatan and Territory of Quintana Roo increased significantly--particularly of such valuable species as red snapper, group-

er, and spiny lobster. Catches of principal species were:

	Yucatan	Quintana Roo
	... (Metric Tons) ...	
Grouper	7,642.0	92.5
Red snapper . .	947.4	-
Spiny lobster .	-	56.5
Other	2,469.1	448.5
Total . . .	11,058.5	597.5

In Yucatan, the 1966 catch of red snapper more than doubled 1965's 467 metric tons. The increase resulted from an addition of 17 vessels (55-67 feet long) in the fleet fishing especially for snapper.

* * *

NEW SEAFOOD FREEZING PLANT OPENS

Refrigeradora de Tepepan, S.A. de C.V. recently opened a freezing plant and branch office at Ciudad Juarez, Chihuahua, to distribute Pacific seafood. This company is the Federal Government's seafood freezing agency and forms part of the plans to increase fishing and fish consumption in Mexico. It is a trust fund administered by the Cooperative Development Bank.

The plant's opening indicates the Government campaign is serious, and that the experience gained in the border town may be useful to similar branches elsewhere in Mexico. The address: Callejon Progreso 108. ("Mexico Industrial," March 6, 1967.)

* * *

SPINY LOBSTER SEASON BREAKS RECORD

The 1966/67 lobster season in Baja California that ended March 15 broke all records, according to preliminary figures of the Ensenada office, Mexican Bureau of Fisheries.

Nine of the 10 producing cooperative fishermen's associations reported significant increases in catches over last season's banner output. Also, losses due to mortality during handling and shipping decreased. The single licensed processing plant at Ensenada packed and exported 2,652,667 pounds of spiny lobsters during the 1966/67 season, compared to 2,014,131 pounds of the previous year. The total 1966/67 catch was 2,788,574 pounds, of which 134,542 pounds could not be

Mexico (Contd.):

packed because of mortality (only lobsters that arrive at the plant alive may be cooked.

Nearly All Exported to U. S.

Virtually all production is exported to the U. S. Fishery authorities believe catches could be increased in Baja California by introducing deep-water fishing gear and new techniques. Although Baja California has had nearly a monopoly on Mexican spiny lobster production, the Gulf and Caribbean coasts of the Yucatan Peninsula have produced greatly increased catches in the last 2 or 3 years. Also, private and government groups have begun to explore along the Pacific Coast south of the Gulf of California, an area previously exploited only slightly for the local market. Altogether, Mexico may become increasingly important as a supplier of spiny lobsters to the U. S. market. (U. S. Embassy, Mexico, March 30, 1967.)



Brazil

HAS NEW BASIC FISHING LAW

Brazil's new basic fishing law (No. 221, February 28) revokes the restrictive 1938 Fishing Code. It gives the green light to foreign investors to develop the fishing industry.

Two articles have major significance for potential investors and are expected to stimulate strongly the development of the industry: Article 6--removes the restriction on foreign vessel operations in Brazilian waters if they are properly registered and authorized; Article 8--extends ownership registration of fishing vessels (formerly limited to Brazilians) to companies organized in Brazil, if they comply with registration requirements. However, in accordance with the Brazilian Constitution, the new law requires that two-thirds of the crews must continue to be Brazilian.

Development of a modern well-equipped fleet should be accelerated by the measure's tax exemptions. Firms with fishery projects approved by SUDEPE (Superintendency for Development of Fisheries) are exempt from the import tax and the Tax on Industrialization of Products up to fiscal 1972 on imports of fishing vessels and equipment not available in Brazil. Fiscal year is equivalent to

calendar year. Manufacturers of fishing equipment also are exempted.

Also, exemption from federal taxes or charges is granted to 1972 on fish taken in Brazilian waters and intended for domestic use or export.

Provides Incentives to Invest

Three kinds of investment incentives are provided: 1) This applies to fishing companies with plans approved by SUDEPE. They will receive 100-percent exemption from income taxes and surtaxes up to 1972--provided that the exemption value is incorporated into the company's capital. Stocks, quotas, and shares of capital received from this capitalization also are exempt from income tax.

2) Applies to any corporate body registered in Brazil. Brazilian firms may deduct from income tax and surtaxes up to 1972 a maximum of 25 percent for investment in fisheries projects that SUDEPE declares useful to industry development. Such projects include capture and processing of fish--and their transportation and marketing. Companies receiving tax benefits must invest one-third of it. The deductions may be applied to more than one project, but they may not exceed in one year 50 percent of the firm's income tax and surtaxes.

3) Applies to expenses incurred in SUDEPE-approved resource research and to donations to nonprofit institutions for conducting SUDEPE-approved programs of technical education and resources research. Firms may deduct these operational expenses; individuals may deduct them up to 50 percent of gross income.

Seeks More Efficient Industry

The law aims to make the existing industry more efficient. The government will stimulate the creation of cooperatives in fishing villages, Fishermen's Colonies, and fish distribution centers in principal cities on the coast or on rivers. Fishermen's Colonies and other organizations also are to be reorganized and regulated by the government.

Regulations to implement the law are expected to be issued within a few months. (U. S. Embassy, Rio de Janeiro, March 14, 1967.)



Argentina

REACTS TO SOVIET FISHING ON PATAGONIAN SHELF

In early 1966, the Soviet Union established a Fishing Fleet Command at Havana, Cuba, to exploit the southwest Atlantic fishing grounds. During the late summer, many Soviet vessels from the Northwest Atlantic were seen moving southward: first into the Caribbean and the Gulf of Mexico and, last, along the Brazilian coast towards the tip of South America.

On Sept. 30, 1966, the Argentine Navy stopped and searched two Soviet and one East German fishing vessels off Buenos Aires Province. The vessels were not detained; the reasons for the boarding are not known. The East German vessel was probably the research ship "Ernest Haeckel." Other Soviet vessels were sighted by the Argentines in mid-October and early November 1966, but no action was taken.

On Nov. 18, 1966, a reporter for the Bahia Blanca (city south of Buenos Aires) newspaper "La Nueva Provincia" flew with a Navy pilot on surveillance from Nueva Espora Naval Air Base. Twenty-two Soviet vessels were sighted and photographed. They were in 2 groups: one of 5 vessels at 40° S. and 61°40' W., or about 25 miles off Argentina's coast just NNE, of Isla De Los Riachos. One vessel was a mothership "larger than the biggest Argentine destroyers." The second group of 15 vessels was 30 to 80 miles off the city of Bahia San Blas. The San Blas region is one of the most important fishing centers. Most Soviet vessels in that group were identified as large stern factory trawlers of the "Maiakovskii" or "Tropik" classes. Two other Soviet vessels were sighted near the two main groups. No Soviet vessel was sighted within 12 miles of the coast.

Argentina Protests

Soon afterward, the Argentine Ministry of Foreign Affairs protested to Soviet Ambassador Volskii. The Under Secretary of Foreign Affairs, J. A. Mazzinghi, later told the press that he had informed the Ambassador of the "Argentine position concerning the fishing problem," which directly affects the nation's economy.

In early Dec. 1966, military planes and private vessels sighted Soviet vessels off Necochea, the Valdez Peninsula, and else-

where. The sightings were extensively reported in the press.

Finally, Argentina's fishing industry became concerned. On Dec. 12, 1966, the press reported: (1) fishermen accused the Soviets of using explosives in mass killings of fish. (2) Cuban and Yugoslav vessels and a "large" Japanese fleet were in the area. (3) Mar del Plata fishermen threatened to strike to protest the government's "lack of concern" over foreign fishing. (4) The fishing industry feared depletion of resources within 60 days and wanted extension of territorial limits to 200 miles.

The Japanese fleet probably consisted of about 70 tuna vessels, which had been reported fishing off Brazil in mid-December. The Yugoslavs recently began tuna fishing with 3 vessels in the southeastern Atlantic and may have entered the southwestern Atlantic. Cubans, who recently purchased 20 tuna vessels from Spain, reportedly planned to use them in the south Atlantic. It is doubtful that the Soviet fishermen would use explosives for fishing but it is conceivable that some Soviet or East German research vessel may have used explosive charges in its research.

The U. S. Embassy at Buenos Aires reported, Jan. 4, 1967, that Argentina had adopted a 200-mile maritime jurisdiction.

* * *

SOVIET RESEARCH SUB REPORTED OFF ARGENTINA

A "mysterious" submarine, allegedly Soviet, was reported in Argentine waters on March 11, 1967. It was on the Patagonian Shelf, where Soviet fishing fleets were recently sighted. One Argentine interpretation for the sub's presence was that it will defend the Soviet fleet (about 48 vessels) from possible attack.

Most likely, however, it is the research submarine "Severianka," of the Polar Scientific Research Institute for Fisheries and Oceanography (PINRO) of Murmansk. A few months ago, it was reported off South-West Africa engaged in fishery research. It is likely she crossed the Atlantic to operate off Argentina.

* * *

Argentina (Contd.):

HAS NEW EXPORT TAX LAW

Argentine Law No. 17,198, March 13, 1967, establishes ad valorem (in proportion to the value) export taxes for most major export commodities. All of the following have a 16 percent rate: fish and shellfish, without exception, and including fish and marine mammal fats and oils (including refined); whale sperm and sperm of other cetaceae (sperm-aceti) in the rough state, pressed or refined, including artificially colored; products prepared from fish and shellfish; shellfish and fish meals and powders. (U. S. Embassy, Buenos Aires, April 12, 1967.)



Cuba

FISHES OFF ARGENTINA

On Sept. 10, 1966, the Cuban stern trawler "Biajaiba" left Havana for a 71-day fishing trip off the South American coasts. The 1,113-gross-ton vessel, built at Vigo, Spain, traveled 6,000 miles to 75 miles off Argentina's coast between Quequen and Punta San Blas (40°20' S.).

The live-weight catch was 648 metric tons, 621 tons of which (95.8 percent) were southwest Atlantic hake. About 481 tons (77.5 percent) of the hake consisted of fish averaging 35 centimeters (almost 14 inches). The rest of the live-weight catch (27 tons) was large squid and an unidentified species (25 cm, or almost 10 inches long called in Spanish "salema").

The trawler fished only 26 days (Oct. 14 to Nov. 9); the rest of the time (45 days) was spent traveling to and from the grounds. The average daily catch was about 25 metric tons or about 455 kilograms (1,000 pounds) per crew member of 55 (9 Soviets, including the captain, Ivan Zainukov, and 46 Cubans). The finished product was 450 metric tons of frozen fish. Since the vessel's freezing equip-

ment could not process more than 17.3 metric tons of raw fish a day, only the best fish were frozen. (The rest, or close to 200 tons, was probably discarded.)

The hake were caught in waters 60-75 meters (197-246 feet) deep and having a temperature of from 10° to 11° C. (50° to 51.8° F.). The Biajaiba was serviced by the Soviet fleet off Argentina. ("Granma," Dec. 25, 1966.)

Another Cuban vessel, the "Guasa" (also built in Spain and Biajaiba's sistership (also was reported fishing for hake in the same southwest Atlantic area. Soviet hake operations in that area are probably similar. Many of Biajaiba's fishermen are extremely young (17 and up); the third officer, a veteran of 5 years in the Cuban fishing fleet, is only 18.



Guatemala

CATCHING SHRIMP IS MAJOR PART OF FISHING INDUSTRY

A new BCF leaflet states that Guatemala has a coastline of 402 kilometers--255 on the Pacific Ocean, the remainder on the Atlantic. The major share of her fishing industry is devoted to catching shrimp, although some finfish and other crustaceans and mollusks are caught for commercial use. At the present time, shrimp fishermen are forced to throw back roughly 5-10 pounds of fish for each pound of shrimp caught, according to Government estimates, because there are no facilities for processing the fish. More fish processing facilities must be constructed and a larger fishing fleet acquired, the latter presumably by private investment. The leaflet includes tables on recent and projected fish catches, exports, and local consumption.

Note: FFL-111--"Exploitation of Marine Resources in Guatemala," is available free from the Branch of Foreign Fisheries, BCF, Room 8015, U. S. Department of the Interior, Washington, D. C. 20240.



EUROPE

USSR

REPORTS 1966 PACIFIC RESEARCH AND 1967 PLANS

In early March 1967, the Scientific Council of the Pacific Scientific Research Institute for Fisheries and Oceanography (TINRO) held its annual session. Thirty-eight scientists from TINRO and its 4 affiliated Institutes reported on 1966 fishery research and plans for 1967 scientific investigations. Also present were delegates from the All-Union (Federal) Scientific Research Institute for Fisheries and Oceanography (VNIRO) in Moscow, biologists and technologists from the Vladivostok University, and scientists from the Vladivostok Branch of the USSR Academy of Sciences.

In 1966, 26 of TINRO's fleet of over 50 fishery research vessels were engaged in distant-water research spanning the entire Northern Pacific and reaching as far south as New Zealand and Australia. Fisheries research was concentrated in the Japan, Okhotsk, and Bering Seas; the North Pacific Ocean off the Canadian, U. S., and Mexican shores; the New Zealand Plateau and the Great Australian Bight with adjacent areas; and the Indian Ocean. There also were some studies of the fishery resources off southeast Latin America. TINRO employs over 300 scientists.

TINRO's discoveries of new fishery resources made it possible for the Soviet Far Eastern Fishing Fleet to expand operations into the waters off British Columbia, Oregon, and Washington, Baja California, and into the southern Pacific and Indian Ocean. Off the U. S. Northwest Pacific coast alone, Soviet fishermen landed over 130,000 metric tons of Pacific hake and about 10,000 tons of Pacific ocean perch and other rockfish.

Problems for Technologists

In 1966, catches of previously not-fished-for species posed many problems to TINRO's fishery technologists. New methods had to be worked out to process Pacific hake, tuna, swordfish, and other pelagic species. In 1967, the Far Eastern technologists are again faced with the task of developing processing techniques for new species of fish the Soviets expect to catch--North American and Southeastern Pacific types of mackerel-pike (saury), anchovy, shark, mackerel, and others.

To increase landings, the Fishing Gear Laboratory of TINRO developed a new 25-meter (81-foot) wide trawl. The standard Soviet trawl is 31.2 meters, or 101 feet, wide. The new trawl was used experimentally in midwater trawling by the large stern trawlers "Mgachi" and "Baikal" with excellent results: catches were 2 to 3 times greater than those made with the standard trawl. There was no difference in catches when new and standard trawls were used for bottom fishing.

Other matters discussed at the annual session were Pacific resources of squids, mussels, and scallops; marine algae; the effect of tree-felling on natural reproduction of salmon; introduction of purse seining in Pacific herring fishing; potential for future increased landings from the Pacific and Indian Oceans.

* * *

FISH AND CAN SHRIMP OFF ALASKA'S SHUMAGIN ISLANDS

During a fisheries patrol by the U.S. Coast Guard cutter "Confidence," on December 30, 1966, a cutter officer and a BCF Resource Management agent visited the Soviet floating shrimp cannery "Vasilii Putintsev" anchored off Nagai Island in the Shumagin Islands.



The 12,700-gross-ton Soviet floating cannery Vasilii Putintsev is used to process small shrimp landed off Shumagin Islands by about 20 medium (700 gross tons) freezer trawlers, class SRTM-Maiak. (Photo: James H. Branson, BCF Resource Management Agent.)

The Putintsev had arrived off Alaska that month to service 20 medium freezer trawlers shrimping off the Shumagins. She is like 14 other "Zakharov"-class cannery ships operating in the Pacific--12,700 gross tons,

USSR (Contd.):

520 feet long, sea endurance of 9-10 months, and a crew of over 600 (500 are processing workers). The Zakharov-class vessels are used primarily in North Pacific king crab, saury, and herring fisheries.

The captain of the Soviet cannery told the Americans that she would remain in the Shumagin area until early March 1967, then enter the king crab fishery off Kamchatka.

How Shrimp Are Handled

During a tour of the Putintsev, the Americans observed:

The shrimp are hoisted aboard from medium freezer trawlers in large, apparently wooden containers, about 4 by 4 by 4 feet. There is a way of emptying these boxes through the bottom or lower side without tipping them.

Then the shrimp are placed in 10-kilogram mesh bags, which go through a continuous blancher on a conveyor belt and receive a 5-minute cook. The bags of shrimp are then routed down another continuous belt into the main deck compartment, where the shrimp are dumped and placed on one of many large stainless steel tables for hand picking. Only pink shrimp (*P. borealis*) were seen on the peeling tables. There was hardly any "trash" mixed with the shrimp--probably because they had been sorted at least once between receiving and bagging.

This main-deck working compartment is 150 feet long and the ship's full width, except for rather narrow weather deck spaces on either side. The workers were lined shoulder to shoulder at the tables; there must have been 100-150 people hand peeling shrimp.

The shrimp meats are peeled into large square metal pans. When a pan is filled, it is taken to an elevator at the after end of this compartment and sent down to the next lower deck.

Shrimp Meats Washed

The pans are dumped on long tables with conveyor belts running down the middle. The meats are washed with sea water and the odds and ends of shell, etc., removed by other workers. The washed meats are put in small plastic trays. These trays are then weighed

and the exact amount of shrimp needed to fill a can added or subtracted. Then they are passed to other workers, who place the meats in parchment-lined quarter-pound flat cans. The cans are routed through the usual canning machinery (all Japanese made), and re-torted. When taken from retorts, canned shrimp are repacked in stout, 72-can wooden cases.

Most of this fishery seems to take place at night. Many boats tied up during the day are waiting to deliver to the factoryship.

* * *

INCREASES SHRIMP CATCHES OFF ALASKA

Soviet catches of shrimp in the Shumagin Islands area in the Gulf of Alaska during January-February 1967 were much greater than during the same period last year. About 20 medium trawlers had caught an estimated 5,000 metric tons by the end of February. In early February, the fleet caught on the average up to 120 tons a day--an average daily catch of 6 tons (13,000 pounds) per trawler. Shrimp are delivered to the "Zakharov"-class canning factoryship "Vasilii Putintsev" for canning, presumably for domestic markets.

In 1966, the Shumagin Islands area yielded 10,600 metric tons of shrimp; 6,517 tons were exported to Japan.

* * *

CONDUCTS FISHERY RESEARCH OFF WESTERN SOUTH AMERICA

In early February 1967, the Pacific Scientific Institute for Fisheries and Oceanography (TINRO) reportedly sent 2 fishery research vessels on an exploratory cruise off Western South America. During a 6-month research period, TINRO scientists will study the commercial fishing potential of Southern Pacific pike-mackerel (saury).

The development of saury fishing in the southeastern Pacific off Chile and Peru during winter months would make it possible for the Soviets to continue using the specialized vessels that fish for saury in the northwestern Pacific (off Japan and Kuril Islands) during summer months.

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USSR (Contd.):

HAS FISHING NET FACTORIES

The Soviet fishing-net plant at Klajpeda in Lithuania is scheduled to produce about 100,000 nets this year. Only 20 percent of them will be made of synthetic materials; the rest of cotton. Most of the nets are probably drift nets.

Also, the plant will produce 1,200 trawl nets and 10 purse seines, the latter 610 meters (1,830 feet) long, 120 meters high and weighing 9-12 metric tons (depending on materials used). The nets are used primarily by Lithuanian fishermen, but some are exported to Cuba, Guinea, and Yemen.

Another Soviet net factory, located at Nakhodka in the Far East, manufactured about 700 trawl nets, mostly synthetic, during 1966.

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"OKEANOLOGIIA" REVIEWS SECOND INTERNATIONAL OCEANOGRAPHIC CONGRESS

The November-December 1966 issue of the Soviet oceanographic journal "Okeanologiya" contains 6 articles by Soviet authors reviewing the Second International Oceanographic Congress held in Moscow in June 1966. The fields reviewed are: physical oceanography, regional oceanography, marine chemistry, biological oceanography, tectonics, and geomorphology. The Soviet authors are: Belousov, Kitaigorodskii, Burkov, Chigirin, Beklemishev, et al., and Zhivago.



Poland

WILL BUILD OCEANOGRAPHIC
VESSELS FOR USSR

The Soviets contracted with a Szczecin shipyard on Nov. 2, 1966, for the delivery of 9 oceanographic research vessels of the B-88 class. The 2,500-gross-ton vessels will be 97 meters (318 feet) long, 14 meters (46 feet) wide, and have a diesel motor of 2,400 hp. ("Budownictwo Okretowe," Jan. 1967.)



Norway

OUTLOOK FOR WINTER
HERRING FISHERY REPORTED GOOD

A scientist of the Norwegian Institute of Marine Research said in a recent interview that the vessel "Johan Hjort" had taken larger quantities of winter herring on a recent cruise off Norway's West Coast than had been seen for many years. Schools a quarter of a mile long and 100 meters deep were found. If weather continues good, prospects are excellent for winter herring catches exceeding 450,000 metric tons. Fish of the 1959 and 1960 year-classes will be prevalent in the stocks this year, but there will also be fish of the 1961 year-class. The herring caught this year will be only average size. Unfortunately, the younger year-classes are not abundant and the stocks are expected to decline in 1968. This will result from natural conditions, not from the heavy fishing expected. ("Fiskaren," Feb. 8, 1967.)

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CANNERS OF SILD HERRING
HAD GOOD YEAR IN 1966

Norwegian canners of sild sardines had a good year in 1966. They produced 1.5 million cases, the best pack in recent years. The pack of brisling also was good. Production of small sild in early 1967 should be good because there are sizable frozen stocks in storage.

Despite the large final pack of sild sardines, exports declined in 1966 because of supply shortage early in the year. The decline was partially offset by higher exports of brisling. Canned exports of kippered herring and soft herring roe also rose in 1966.

Exports of Principal Canned Fishery Products, 1965-1966		
Product	1966	1965
	* (Cases of 100 $\frac{1}{4}$ cans) *	
Brisling	440,000	391,000
Sild sardine	811,000	925,000
Kippered herring	265,000	257,000
Soft herring roe	84,000	59,000

U. S. Is Principal Market

The principal market for Norwegian canned fishery products is the U. S., which bought 10,269 metric tons as of November 30, 1966, compared to 10,321 tons in the 1965 period. Shipments to other leading buyers in the first

Norway (Contd.):

11 months of 1966 (comparative data for 1965 in parentheses) were: United Kingdom 6,788 tons (5,282 tons); Australia 1,678 tons (1,758 tons); South Africa 1,077 tons (1,335 tons); and Canada 942 tons (966 tons). ("Norwegian Cannery Export Journal," Feb. 1967.)



Iceland

PRICES FALL AND FOREIGN MARKETS ARE UNCERTAIN

Iceland's 1966 catch was estimated at a record 1,240,000 metric tons: herring, 775,000 tons (763,000 tons in 1965), capelin, 125,000 tons (50,000 tons in 1965), and crustacea (lobster and shrimp) 5,000 tons (same as 1965). More herring and capelin were caught in 1966 because more vessels fished for them.

At the beginning of 1967, there were 184 herring vessels over 100 gross registered tons (GRT). The average size was 193 GRT. Thirty-seven new ones (average size 318 GRT) will be built during 1967. But small vessels (under 100 GRT) decreased from 648 in 1964 to 577 at the beginning of 1967. Of 32 registered trawlers (700 to 1,000 GRT), only 20 are being operated.

Frozen Fish Production Drops

Frozen fish production was about 85,000 tons in 1966, a 15-percent drop from 1965, when only 19 percent of freezing-plant capacity was used. The 2 largest freezing-plant firms, Federation of Cooperative Societies and Freezing Plants Corporation, account for over 90 percent of total output. They produced an estimated 49,000 tons of frozen cod fillets and blocks in 1966 (55,000 tons in 1965), 22,000 tons of frozen herring (27,000 tons in 1965), and 8,000 tons of animal food (9,000 tons in 1965). About the only encouraging development for the freezing industry in 1966 was the favorable Soviet market. Sales to the USSR were 12,500 tons (9,900 tons in 1965), up 26.3 percent. The U. S. market absorbed 27,200 tons in 1966 against 28,200 tons in 1965, down 3.6 percent.

Fish meal production in 1966 is estimated at 178,000 tons (174,000 tons in 1965). Of this, herring meal was about 135,000 tons, cod meal 19,000 tons, and capelin 19,000 tons; the remaining 5,000 tons were ocean perch and other species.

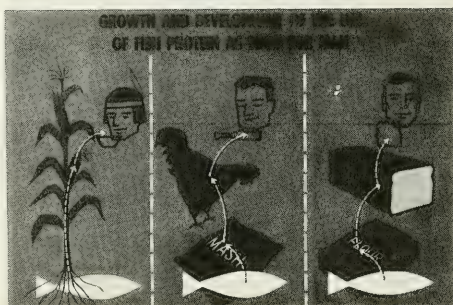
An estimated 107,000 tons of fish oil were produced in 1966--herring oil was 97,000 tons, cod-liver oil just over 6,000 tons, and the remaining 4,000 tons were capelin and whale oil.

Problems for Industry

The most serious problems facing the fisheries are the fall in prices and the uncertain foreign market for major exports.

The changes in the composition of the catch have produced severe bottlenecks, especially for freezing plants because the biggest share of the cod catch of the small vessels is landed between February and April. This results in great underutilization of capacity in other months. The cutback in fishing by large trawlers has compounded this difficulty. Groundfish fishermen recently were given more government subsidy for exvessel prices. But these fishermen have asked for more help.

Two recently proposed parliament bills would influence further fisheries developments. One seeks to provide partial compensation for any decreases in world market prices below end-1966 levels. The other bill calls for founding a fisheries council to coordinate the entire industry--and to conduct market research and development for fish products abroad. (U. S. Embassy, Reykjavik, March 16, 1967.)



Greenland

CONCERNED OVER LOW PRICES FOR SEAL SKINS AND COD

During the past year, Greenland has faced declining prices for seal skins and market problems for frozen cod fillets. The impact is felt primarily in the hunting districts of Northwest and Eastern Greenland, where prices to the seal hunter have dropped 42 per cent.

Segments of Greenland's native population may face a bleak future if markets for seal skins and frozen cod fillets remain weak--and if cod catches drop, as fishery biologists predict. ("Berlingske Tidende," Feb. 20, 1967.)



United Kingdom

WORLD FISHING EXHIBITION OPENS IN JUNE

The British periodical "World Fishing" is sponsoring a World Fishing Exhibition at National Hall, Olympia, London, June 1-7, 1967. It will be opened by Food and Agriculture Organization Director-General B. R. Sen, accompanied by FAO Assistant Director-General (Fisheries) Roy Jackson.

The 1967 Exhibition will feature the latest technological developments in fishing vessel design, marine engines (main and auxiliary), fishing gear, nets, deck machinery, marine electronics and fish-finding equipment, refrigeration, ice-making and processing equipment, and services. Exhibits from 15 countries will be displayed.

Vessel Display at Fish Dock

A new feature this year will be the Olympia Fish Dock--a display of stern trawlers, multipurpose vessels, fast lobster boats, and a new fishing catamaran.

On June 2 and 3, a nontechnical shellfisheries meeting will take place at Olympia along with the exhibition. The aim is to show how efficiency in shellfisheries can be improved by better gear and better marketing.

Admission is by invitation ticket only. Requests for tickets and information to: Commercial Exhibitions, Ltd., The Tower, 229-243 Shepherd's Bush Road, Hammersmith, London, W6, England.

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ISSUES PROGRESS REPORT ON BOXING FISH AT SEA

The British White Fish Authority, sponsor of extended tests of boxing fish in ice at sea aboard a middle- and a distant-water trawler, has issued a 19-page, illustrated progress report. It states: boxing fish at sea, properly done, improves quality; and further improvements are obtained if boxed fish are landed and offered for sale without being disturbed--because this eliminates damage from hooks and shovels and the fish are protected by ice while awaiting sale. Boxing at sea also could facilitate the techniques of transferring fish at sea or of superchilling.

Alloy Metal Box Used

A light alloy metal box, easily cleaned, was used in the tests. The box was $32\frac{3}{4} \times 10\frac{1}{4} \times 15$ inches, internal volume 4,800 cubic inches, and holding about 150 pounds. It was considered important for it to be no deeper than 12 inches to avoid crushing the fish on the bottom--and to have drainage (drain holes were set in side gulleys). Circular pressings force the boxes apart $\frac{3}{8}$ inch in stowage to prevent pockets of liquid from collecting. The boxes could be nested when empty.

The tests were supervised by the Authority's Industrial Development Unit, Southside, St. Andrew's Dock, Hull, England.

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FISHERY LOAN INTEREST RATES REVISED

The British White Fish Authority has announced that its rates of interest on loans made from February 4, 1967, will be:

For fishing vessels of not more than 140 feet, new engines, nets and gear: on loans for not more than 5 years, $7\frac{3}{8}$ percent (decrease $\frac{1}{4}$ percent); on loans for more than 5 years but not more than 10 years, $7\frac{1}{4}$ percent (decrease $\frac{1}{8}$ percent); on loans for more than 10 years but not more than 15 years, $7\frac{1}{4}$ percent (de-

United Kingdom (Contd.):

crease $\frac{1}{8}$ percent); on loans for more than 15 years but not more than 20 years, $7\frac{1}{4}$ percent (no change).

The rate for processing plants on loans for not more than 20 years was unchanged at $7\frac{3}{4}$ percent.

The rates on loans made before February 4 were unchanged. ("Fish Trades Gazette," Feb. 11, 1967.)



Portugal

TUNA FIRM EXPANDS AT CAPE VERDE ISLANDS

The Portuguese firm that operates cold-storage facilities at Mindelo on Sao Vincente plans to order four 127-foot purse-seiners from a West German firm. Delivery is expected in 1968. The Portuguese Ministry of Finance is expected to guarantee a loan equivalent to US\$2.6 million to finance the purchase. With the new vessels, the firm expects to increase its annual tuna catch from 600 to 8,000 metric tons; most would be sold to foreign canners. The firm also wants to expand Sao Vincente as a base for foreign fleets by increasing its cold-storage capacity.

The company now has 2,500 tons of frozen storage capacity at Mindelo, most of it newly inaugurated. Forty percent of this is currently being rented to Japanese and Panamanian flag tuna vessels using Sao Vincente as their home base and selling their catch largely to U. S. packers. The remaining 60 percent is available to the new Portuguese vessels under construction and to the expansion of rental facilities to foreign fleets.

Should the Portuguese company's experience with the 4 vessels prove financially successful, it will seek more government guarantees to finance the purchase of 6 more purse-seiners. If future experience justifies it, the company may increase the refrigeration capacity of its present plant to 3,500 tons. If Sao Vincente is used more by foreign tuna fleets, the firm may construct a new 3,500-ton refrigerated storage plant on the docks at

Mindelo. The present facilities are located 800 yards from the waterfront. (U. S. Embassy, Lisbon, March 6, 1967.)



Greece

1966 CATCH WAS UP SLIGHTLY

The Greek catch in 1966 was estimated at 108,100 metric tons (up 1.4 percent from 1965). Of that total, 29,600 tons (up 9.2 percent) came from deep-sea waters, mainly the Atlantic; 66,500 tons (down 6.3 percent) from Greek and Mediterranean waters; and 12,000 tons (up 41.6 percent) were taken from inland waters.

Five vessels were added to the deep-sea fleet during 1966. Ten more are expected to be added this year.

A company was set up in February 1967 by the Hellenic Industrial Development Bank (ETVA), a quasigovernmental financial institution, to organize the production and marketing of the deep-sea catch.

Fishing in the Mediterranean was generally poor and resulted in the 6.3-percent catch decline. The increased production of fish in inland waters was achieved with the aid of a program sponsored by the Greek Government. Under it, rivers and lakes were stocked with fast-growing species, particularly trout. (U. S. Embassy, Athens, March 16, 1967.)

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ATLANTIC FREEZER FLEET INCREASES

The Greek freezer trawler fleet, 37 vessels at end of 1966, landed 29,582 metric tons of frozen fish in 1966, compared with 27,073 tons in 1965 and 21,039 tons in 1964. The vessels fish in the Atlantic off Africa's Northwest Coast.

Although total catches have increased as fleet expanded, the average annual catch per vessel has dropped from 1,095 tons in 1962 to 954 tons in 1966. Wholesale prices at point of first sale for frozen fish averaged \$394 a ton in 1966, compared with \$383 a ton in 1965. ("Alieia Fishing," Jan. 1967.)





Cleaning salmon.

(Photo: USIA/National Archives)

ASIA

Japan

FISHERIES AGENCY BUDGET IS UP FOR FY 1967

The Japanese Government has adopted the budget for fiscal year 1967 (April 1967-March 1968). Estimates for the Fisheries Agency, Ministry of Agriculture and Forestry, total 26,597 million yen (US\$73.9 million), up about \$6.6 million, or 9.74 percent, over FY 1966's \$67.3 million.

Funding for some proposed FY 1967 programs:

Program	FY 1967		FY 1966	
	Proposed Budget	Regular Budget		
	Yen	US\$	Yen	US\$
	..... (1 Million)			
Fishing port improvement	13,465	37.40	11,379	31.61
Fishery technological improvement	1,013	2.81	933	2.59
Overseas fisheries development	586	1.63	424	1.18
Marine resources cultivation and conservation	509	1.41	484	1.34
Fishery products processing & marketing improvement	367	1.02	351	0.97
Fishery cooperatives consolidation	30	0.08	-	-

New Wireless System Proposed

The budget provides for the "fishery technological improvement" program a new wireless communication system to forecast hydrographic and fishing conditions. This system will be added to existing facsimile and radio communication systems.

The "overseas fisheries development" program includes operation of the new government research vessel (scheduled for completion this fall) in exploratory purse-seine fishing off New Zealand. The results will determine the extent to which the government will license the operation of high-seas purse-seine vessels in the future.

The only new program proposed for FY 1967 is the consolidation of the Nation's 1,400 fishery cooperatives in 4 years to improve their administration. ("Suisan Keizai Shimbun," March 2, 1967.)

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TUNA PACKERS SET BY 1967 EXPORT RULES

The Japan Tuna Packers Association adopted on March 8 these regulations governing canned tuna exports for business year (BY) 1967 (April 1967-March 1968):

- Quantity making up one case: Tuna packed in 7-oz. 48s, 13-oz. 24s, and 66½-oz. 6s will count as one case. 3½-oz. 48s will comprise half a case.
- Sales restrictions:
 - Canned tuna in brine (excluding grade "B" packs) for export to the U.S. will be consigned to Canned Tuna Sales Co.
 - Grade "A" canned tuna packed in brine will be sold for export only to U.S.
 - Grade "B" canned tuna packed in brine or oil will not be sold for export to U. S.
 - Canned tuna not packed in brine or oil, but subject to U. S. import tariffs applicable to canned tuna in brine and oil, will not be sold for export to U.S.
 - Exports of canned tuna not consigned to the Sales Co. must be approved by Japan Tuna Packers Association.
- The BY 1967 quota of canned tuna in brine for export to the U. S. has been set at 2.6 million cases--an increase of 100,000 cases from BY 1966. About 2.34 million cases will be allocated to exporters on past performance records, and 260,000 cases were unassigned. The unassigned quota will be allocated to exporters who have used up their quotas: During each 6-month period, 130,000 cases will be offered on a first-come basis; not more than 4,000 cases will be sold per Association member.
- Price restrictions: Canned tuna consigned to the Sales Co. will not be sold below the following Association-set minimum prices.

Japan (Contd.):

Classification	Can Size	Price Per Case	
		Yen	US\$
White meat solid	13-oz. 24s	2,970	8.25
" " "	7-oz. 48s	3,200	8.89
" " "	3 $\frac{1}{2}$ -oz. 48s	1,860	5.17
" " "	6 $\frac{1}{2}$ -oz. 6s	3,420	9.50
White meat flake	7-oz. 48s	2,330	6.47
Light meat solid	13-oz. 24s	2,330	6.47
" " "	7-oz. 48s	2,380	6.61
" " "	3 $\frac{1}{2}$ -oz. 48s	1,460	4.06
" " "	6 $\frac{1}{2}$ -oz. 6s	2,850	7.92

Source: "Suisancho Nippo," March 9, 1967.

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EXPORTS OF FISHERY PRODUCTS
ROSE 9.5% IN 1966

Exports of fishery products from Japan in 1966 totaled \$362 million--an increase of 9.5 percent over 1965, reports the Japanese Export Trade Organization (JETRO). However, this was only 3.7 percent of total exports of \$9,776.34 million (15.7 percent more than 1965). Exports of marine products are becoming less important each year. The reason: Exports of heavy industry goods remain high, but the production of marine products cannot keep pace with increased domestic demand; it is becoming more difficult to obtain raw fish for export. Also, international regulations of resources are becoming more restrictive, and domestic production of fish in developing countries is increasing.

Japan's Exports of Marine Products for 1966			
	1966	1965	
		... (US\$1,000) ...	
Fresh and frozen products: . . .	118,171	88,837	
Fish	106,697	76,082	
Crustacea and molluscs . . .	8,507	6,560	
Others	2,967	6,195	
Salted or dried products: . . .	8,033	6,118	
Fish	1,699	1,448	
Crustacea and molluscs . . .	2,359	1,622	
Others	3,975	3,048	
Canned and bottled products: .	142,118	138,499	
Fish and whale oil	12,936	20,916	
Pearls	64,697	64,217	
Other marine products	16,096	11,961	
Grand total	362,051	330,548	

Exports of frozen tuna totaled 177,606 tons worth \$81,622,000--an increase of 56 percent over 1965. Significantly, the price of albacore fell sharply last summer due to oversupply, but it recovered completely and remained high through 1966. Also, the high price of

lightmeat tuna for Italy and other European markets was maintained because of the general poor catch.

Exports of frozen broadbill swordfish were almost the same as 1965--7,194 tons valued at \$6,272,000, up 1 percent. This shortage of local supply was due primarily to a poor catch in U.S and Canadian waters.

Exports of sea bream and squid taken by trawl in the Atlantic Ocean decreased because of a poor catch--despite more fishing boats. Also, Greece, Italy, and other major markets limited import of those species. Exports of frozen salmon and whale meat decreased 49.5 percent due to international restrictions on catch and increased domestic demand.

Exports of frozen shrimp increased 69.4 percent--2,477 tons in quantity and \$5,170,000 in value. The reason: British consumer preference for high-quality shrimp.

The production of dried or salted marine products decreased because of reduced catch by coastal fisheries. But increasing were exports of boiled and dried fish ("katsubushi," etc.) for the Ryukyus, shark fin for Hong Kong and Singapore, abalone for Hong Kong, and dried kelp ("kombu") for Southeast Asia.

Exports of canned salmon totaled 1,803,000 cases worth \$38,240,000--down 37.3 percent. The reason: international restriction on catch and an increased production of canned pink salmon in Canada, the major competitor of the U. S. in salmon export.

Canned Tuna Exports Soared

Exports of canned tuna, a leading commodity, increased 33.1 percent (5,281,000 cases at \$47,559,000). Although export of canned tuna in water to the U. S. was rather poor because of high price in first half, the market improved during the second half. Exports of canned tuna in oil and seasoned tuna increased appreciably.

Among the bluefish (canned mackerel, saury, sardine, and horse mackerel), exports of canned mackerel nearly doubled (99.7 percent). The 1965 total was 3,589,000 cases worth \$18,232,000.

Exports of finback whale oil to Europe decreased sharply due to increased regulations of Antarctic whale catch and reduction in land-based whaling. The export of sperm oil to the

Japan (Contd.):

U.S. was not active because of the short supply. So, export of whale oil decreased 39.6 percent from 1965--54,469 tons at \$12,241,000.

The export of pearls, which has grown rapidly in past 4-5 years, did not increase significantly in 1966 because of delivery delays at year's end, a price rise for some sizes, and adoption of tougher inspection standards. However, the exports increased 0.7 percent. The total was 91,281 kilograms (92 tons) worth \$64,562,000. (Fishery Attache, U. S. Embassy, Tokyo, March 16, 1967.)

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1966 SHRIMP IMPORTS SET RECORD

Japanese imports of frozen shrimp in 1966 were a record 36,156 metric tons worth 21,630 million yen (US\$60.08 million). They rose 72.8 percent in quantity and 67.1 percent in value over 1965's 21,011 tons worth 12,930 million yen (\$35.9 million). In value, shrimp accounted for about 40 percent of total fishery imports in 1966.

1966 Shrimp Imports--With Comparisons				
Country of Origin	Quantity		Value	
	1966	1965	1966	1965
	. (Metric Tons) .		. (1,000 Yen) 1/ . .	
Mainland China	11,768.5	5,874.7	8,154,432	4,065,112
USSR	6,517.6	1,631.7	611,943	119,511
Mexico	4,889.3	5,209.9	4,122,522	3,626,980
Thailand . . .	3,690.6	1,975.7	2,614,026	1,358,540
Hong Kong . .	3,170.3	2,579.2	2,470,703	1,777,712
India	993.4	850.5	623,200	429,633
South Korea . .	846.9	1,003.2	371,376	328,084
Sabah (North Borneo) . . .	701.5	337.4	469,824	181,838
Saudi Arabia . .	840.4	-	280,861	-
Australia . . .	685.1	563.5	616,496	426,232
Others	2,052.8	985.2	1,295,368	623,920
Total	36,156.4	21,011.0	21,630,751	12,937,562
1/360 yen = US\$1.				

In 1960, 625 tons were imported; in 1962, 3,642 tons. But in 1963, imports began to rise rapidly--jumping to 11,708 tons. The tremendous increase is attributed primarily to growing demand for this high-priced food brought about by increased earnings of Japanese families. ("Minato Shimbun," Feb. 24, "Suisan Keizai Shimbun," Feb. 10, 1967, and other sources.)

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FROZEN TUNA EXPORT
PRICES CONTINUE DECLINE

Prices of Japanese frozen tuna for export to the U. S. continued to decline in early March. Buy offers from U. S. packers were coming in at US\$470 a short ton c.i.f. for round albacore and \$410 a ton for gilled-and-gutted yellowfin for direct shipment to the U. S. In view of this trend, some observers fear that it may be difficult to hold the line at \$450 a ton for albacore and \$400 for yellowfin.

Japanese circles do not foresee any price improvement so long as yellowfin fishing continues good in the California tuna fishery. They believe also that hasty selling by overseas-based Japanese tuna suppliers is contributing to the decline. ("Suisan Tsushin," March 7, 1967.)

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TUNA FISHING IS GOOD

Japanese tuna vessels in the Pacific, Atlantic, and Indian Oceans in mid-March 1967 had good fishing in all major fishing grounds. In the Pacific, vessels in the Coral and Aradura Seas, where yellowfin and big-eyed fishery was at peak, were catching daily average of 3 metric tons.

In Indian Ocean, catches of yellowfin dropped in the western area, averaging around 2 tons a day; but in eastern part, fishing improved, with landings averaging 3 tons a day. Japanese tuna vessels in that area were reported far outnumbered by vessels of South Korea and Formosa.

In the Atlantic, Japanese long-liners were concentrated near 5° W. longitude and 6° S. latitude off west Africa (about 700 miles south of Ivory Coast) and were catching 3.5-4 tons a day. Portable-boat-carrying motherships there were averaging 14-15 tons a day. ("Katsuo-maguro Tsushin," March 17, 1967.)

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"AUTO-REEL" IN TUNA LONG-LINING IS USED MORE

The "auto-reel" system in handling long-line gear is spreading rapidly in Japan. It was developed jointly as a labor-saving device by Sanmei Trading Company, Hokoku Suisan

Japan (Contd.):

Fishing Company, and the Kanasashi Shipyards. Over 10 tuna long-liners already are using the system successfully. Another dozen vessels are scheduled shortly to adopt it.

The auto-reel pays out and reels in long-lines by remote control and automatically regulates the reeling speed. This eliminates the problem of snapping and tangling of lines during setting and retrieving operations. At first, this equipment was considered unsuitable for vessels under 300 gross tons, but the Kanasashi Shipyards late last year installed it aboard a 250-ton vessel with good results. The Sanmei Trading Company is the sole sales agent for this equipment. ("Suisan Keizai Shimbun," Feb. 21, 1967.)

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JOINT COLD STORAGE ESTABLISHED

The Tokyo Terminal Cold Storage Company, financed jointly by 52 cold-storage firms (including at least 11 fishery firms), was set up on February 28, 1967. The company will rent cold-storage space and handle related business.

Under present plans, cold-storage plants of 10,000-ton capacity will be built, beginning in 1968, at 5 trucking terminals in suburban Tokyo and Yokohama. The owners believe that cold storages will alleviate mounting traffic congestion in central wholesale markets and cold-storage plants in Tokyo. They hope to improve supply and distribution, reduce costs, and stabilize prices.

All major Tokyo fishing firms are participating. The growing domestic demand for frozen fishery products has resulted in about 84 percent of cold-storage space owned by fishery firms being used for fishery products. In earlier years, much of this space was filled with nonfishery products: vegetables, fruits, beef, and ice cream. ("Suisan Keizai Shimbun," March 2 and 3, 1967.)

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REFRIGERATED CARRIER LAUNCHED

The 3,300-gross-ton refrigerated carrier vessel "Seta Maru," ordered by Hoko Suisan Fishing Company's Marine Transportation Division, was launched March 17, 1967, at

the Usuki Shipyards in Hiroshima. The vessel is 334.2 feet long, 49.2 feet wide, and 25.6 feet in molded depth. It has a dead-weight tonnage of 3,500 tons and is powered by a 5,580-hp. diesel engine giving a service speed of 18 knots. ("Suisan Tsushin," March 31, 1967.)

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PLASTIC FISHING BOAT DEVELOPED

A small, 1½-ton plastic fishing boat manufactured with a new processing method was shown recently in Japan. Made jointly by Mitsubishi Resin Products Research Laboratory, Asahi Fiberglass, and Takeuchi Paint Manufacturing Company, it is 10 meters (32.8 feet) long, of reinforced plastic, and cost (including engine) 1 million yen (US\$2,778).

Test runs in Tokyo Bay demonstrated its superiority over wooden boats in speed and riding comfort. Research on plastic vessels also is being conducted by the Japanese Fisheries Agency's Fishing Boat Research Laboratory in collaboration with Hitachi Chemical Industries. ("Suisan Keizai Shimbun," March 7, 1967.)

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IRAQ SEEKS JOINT VENTURE WITH JAPAN

The Japanese Foreign Ministry reportedly received an inquiry from a Baghdad fishery firm seeking Japanese partners for a joint fishing enterprise in Iraq. The proposed venture calls for the operation of 4 fishing vessels, one large processing vessel equipped with a fish meal plant, a cold storage, and a warehouse. The Japanese Government reportedly supports the idea of extending Japan's technical and financial assistance to develop new fishing grounds in the Persian Gulf. ("Minato Shimbun," March 4, 1967.)

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GOVERNMENT APPROVES INVESTMENT IN PERUVIAN FISH MEAL PLANT

The Japanese Government Overseas Investment Liaison Council approved on March 8 Taiyo Fishing Company's planned capital investment in the Peruvian fish meal enterprise operated by Inmarl Company. Taiyo

Japan (Contd.):

will put up 50 percent, or US\$233,000, of Inmarl's expanded capitalization of \$466,000. It will provide Japanese fishery technicians to improve fishing efficiency. Production target is 40,000 tons of fish meal and 3,200 tons of fish oil annually until 1970.

Taiyo will undertake the marketing of 20,000 tons of fish meal--likely to Europe because Taiyo now does not have an allotment to import fish meal into Japan.

Inmarl Company, a U. S.-owned firm, was established in Lima in 1961. It operates at Cape Atico a plant served by 14 anchoveta purse-seine vessels. Meal production was 20,000 tons in 1965 and 16,000 tons during first-half 1966. ("Suisancho Nippo," March 13, 1967.)

* * *

EXPLORATORY FISHING OFF U. S. EAST COAST IS REPORTED POOR

The Japanese Taiyo Fishing Company's 369-gross-ton trawler "Taiyo Maru No. 32," exploring for shrimp and sea bream off the U. S. east coast near 35° N. latitude (off North Carolina) reported poor results, as of early March 1. Catch per day of operation averaged 5-6 metric tons of bottomfish, with very small quantities of shrimp and sea bream.

The vessel is exploring the area west of longitude 40° W. (the line running north-south through the middle Atlantic) between latitudes 10° N. and 40° N. (between New York and northern South America). This is part of Taiyo's plans to establish year-round trawl operations in the western Atlantic Ocean. But prospects now are not promising.

In 1963-64, Taiyo conducted experimental fishing in the northwest Atlantic with the converted 3,700-ton trawler "Tenyo Maru No. 3" without success. ("Shin Suisan Shimbun Dokuho," March 3, 1967, and other sources.)



Malaysia

JAPANESE WILL ESTABLISH ANOTHER TUNA BASE IN PENANG

The Japanese trading firm Mitsui Bussan and the Atlantic Tuna Fishery Cooperative Association are planning to establish a tuna base at Penang, Malaysia. They propose to employ temporarily Formosan and Okinawan vessels pending approval of their venture by the Fisheries Agency. Already, they have contracted for 8 vessels to supply the base. This development has drawn considerable attention in the Japanese tuna industry because Penang already has a joint Japanese-Malaysian tuna base. It was established in 1959. ("Katsuo-maguro Tsushin," February 22, 1967, and other sources.)



South Korea

PLANS LARGE CANNERY WITH U. S. AID

The South Koreans are planning to build a cannery on Cheju Island, off Korea's southern tip, which will have an annual capacity of 1 million cases of tuna and 2 million cases of mackerel. U. S. private and Government capital reportedly will be involved.

The Japanese doubt that S. Korea will have a sufficient supply of raw fish--but they are concerned. The reported capacity of the new cannery is almost half of Japanese exports of canned tuna to the U. S., and over half all Japanese exports of canned mackerel.



Philippines

LAUNCH RESEARCH VESSELS

On March 29, two Philippine oceanographic research ships were christened: the "M/S Researcher I," and the "M/S Maya-Maya."

The 420-gross-ton, Japanese-built, "Researcher I" was acquired by the Philippine Government under the Japanese reparations program at about US\$770,000. It is designed

Philippines (Contd.):

to train Filipino fishermen in modern trawl fishing, tuna long lining, oceanic observation and investigation, and research on marine fishery resources.

The "Researcher I" is equipped with a semi-air-blast system and contact freezer system using Freon-12 as a refrigerant. It has the latest model equipment for oceanic observation and research, including electronic sounding machine, fish finders, a powerful trawl winch, and line haulers for tuna long lining. There are 4 laboratories: the wet, hydrological, biological, and aquarium and fish laboratory. Living quarters, including those for scientists and officers, are air conditioned. It is the biggest research vessel of the 5 vessels now being operated by the Fisheries Commission.

Second Vessel Built for FAO

The "M/V Maya-Maya" was built in Japan for the United Nations Food and Agriculture Organization under the UN Development Program for training Filipino fishermen in modern purse seining and deep water trawling. The project manager of the UN Special Fund project said the new trawler was acquired for about \$255,000. It is equipped with a variable pitch propeller and has an oversized winch to permit deep sea trawling. It is fitted with hydraulic deck machinery and has a main engine of 510 horsepower and 2 auxiliary engines. It also has a hydrographic winch for scientific observations. Other modern fishing equipment included are long-range radio equipment, sonar fish finder, two echo sounders, radar, radio direction finder, and electronic sea water temperature indicator. The "Maya-Maya" has a large

refrigerated fish hold and air-conditioned quarters for officers and scientists.

The deputy UN resident representative has announced that another fishing/training vessel, the "Hasa-Hasa," was ordered by FAO from an English shipbuilder. It is expected to be delivered in July 1967. (U. S. Embassy, Manila, April 5, 1967.)



Thailand

WILL BE HOME OF ASIAN FISHERY TRAINING CENTER

The 9-nation working party that met in Bangkok, March 13-17, 1967, to discuss southeast Asian fishery development agreed to establish an Asian fishery training center in Thailand. Representatives of Thailand, Japan, Singapore, Malaysia, India, and Indonesia, and observers from Laos, the Philippines, Vietnam, and FAO, discussed primarily the organization of the center, assessments, privileges, and exemptions.

Assessments ranging from US\$1,000-10,000 annually were proposed, but the final decision was scheduled to be made at the cabinet-level meeting in Manila on April 26, 1967. Japan reportedly will assign to the center a new 350-ton training vessel, gear and equipment, and a staff of eight. ("Shin Suisan Shimbum Sokuho," March 24, 1967.)



South Pacific

Australia

WILL CLAIM 12-MILE FISHERIES RIGHTS

The Australian Government will introduce legislation establishing a 12-mile fisheries jurisdiction, the Minister for Primary Industry said in Parliament on March 15. He said it would apply also to the external territories.

He said: "The decision does not involve any increase in the breadth of the territorial sea, which will remain at three miles. The Government has taken its decision in the light of developments in the international law of the sea over the past few years." He noted that many countries have extended their fishing limits to 12 miles: Britain, several Western European states, Canada, New Zealand, and the U. S. New Zealand enacted legislation near the end of 1965; the U. S. in October 1966.

The Minister added: "It is, of course, only right and proper that Australia should take up, and avail itself of, the rights that have become established in this field of international law. There have been suggestions at times that exclusive fisheries rights do not stop at twelve miles and indeed that they extend to all the waters above the continental shelf. The Government's legal advice is that, while the rules of international law enable Australia to exercise sovereign rights for the purposes of exploring and exploiting the mineral resources of the continental shelf as well as certain sedentary fisheries on it, international law does not at present give a coastal country sovereign rights over all fisheries in waters above the continental shelf. In practice, the adoption of a twelve mile limit for fisheries purposes will have the effect of protecting and encouraging the development of the fishing industries of Australia and the Territories. The cray (spiny lobster) fisheries, which are the basis of a valuable export industry, will be given a very substantial measure of protection. The developing prawn (shrimp) fishery and other fisheries will also be assisted. The Government will examine the position of nationals of other countries who have been engaged in fishing in the new zone between the three and twelve miles and will consider whether, as a matter of international comity, a short phasing-out period might be allowed in any appropriate case. Fortunately, so far as both Australia and the Territories are con-

cerned, there is no evidence of any substantial degree of foreign fishing having taken place in the new zone." (U. S. Embassy, Canberra, Mar. 23, 1967.)

* * *

ABALONE FISHERY IS GROWING

Abalone diving, is one of Australia's newest fisheries, is growing in importance. Abalone are collected by SCUBA divers working from launches and small boats. The meat is exported frozen or canned to Asia and the Far East.

Australian production in 1965/66 amounted to 2,924,000 pounds (live weight) worth an estimated A\$285,000 (US\$318,630) exvessel. The southern coast of Tasmania is the main source of abalone, followed by Victoria, New South Wales, and South Australia. ("Australian Fisheries Newsletter," Feb. 1967.)



Fiji Islands

LEAFLET DISCUSSES 1967 FISHING INDUSTRY

A new BCF leaflet states that the Pacific Fishing Company Ltd. has been operating in the Fiji Islands since 1963 from a freezing and storage base at Levuka on Ovalau Island. The company, predominantly Japanese controlled, has concentrated on catching, freezing, and exporting tuna. Japanese groups interested in the South Pacific tuna fishing industry had long hoped to secure a land base in Fiji to provision ships and store catches. Under the Protected Industries Ordinance, since repealed, the company was allowed to set up a freezing and cold-storage base at Levuka with a guarantee that no other company would be allowed to establish a plant in Fiji. The leaflet also discusses operations, condition of the company, and future prospects.

Note: FFL-112--"The Fiji Islands Fishing Industry, 1967," is available free from the Branch of Foreign Fisheries, BCF, Room 8015, U. S. Department of the Interior, Washington, D. C. 20240.



New Zealand

OFFERS PHASE OUT TO JAPAN ON FISHING IN 12-MILE ZONE

The New Zealand Government has decided not to join Japan in submitting the question of the legal validity of the former's 12-mile fishing limit to the International Court of Justice at The Hague. New Zealand extended its fishing zone from 3 to 12 miles in 1965.

As an alternative, the Government has consulted with Japan on the possibility of the latter's vessels having a limited phase-out period of fishing within the zone, providing New Zealand's interests are protected.

New Zealand's Prime Minister said consideration of the legal issues had reinforced his Government's views about the legal validity of extending the fishing zone. He added: "While maintaining our legal standpoint we have at the same time opened up with the Japanese Government the possibility of our reaching an agreement to enable their vessels to have a limited period of phase out of fishing in the New Zealand fishing zone provided the arrangement are in a satisfactory form embodying the conditions necessary to protect New Zealand's interest." ("The Japan Times," Mar. 19, 1967, and U. S. Embassy, Wellington, Mar. 21, 1967.)



RADIATION AND FOOD

Consumers are hearing more and more about foods treated with some form of "radiation" to preserve them, or to kill insects or insect eggs, or to prevent sprouting, or to accomplish some other purpose.

They have begun to ask the U. S. Food and Drug Administration (FDA) questions about such "irradiated" foods.

What is radiation processing of food? Radiation, in its basic terms, consists of the sending of energy from a source to an absorber. Heat is a form of radiation and so is sunlight. To this extent, ordinary cooking is a form of radiation processing.

However, the forms of radiation to which the term is usually restricted are electromagnetic "rays" of much shorter wave length than heat and light, called "X-rays," and waves of still shorter wave lengths called "gamma rays." Also used are very tiny invisible particles of matter called electrons.

X-rays are artificially generated by machines similar to those found in a doctor's or dentist's office. Gamma rays are generally obtained from elements which are called "radioactive" because they give off these rays continually, along with tiny particles of matter. When used in food processing, the radioactive element (or "isotope") is sealed in a container so that only the gamma rays can get out. Electrons may be artificially produced by a source something like the vacuum tube of a radio and are then accelerated to higher energy by an electrical field through which the electron passes.

Radiation processing of food, then, consists of the use of X-rays, gamma rays, or electrons on food to effect changes something like the changes caused by heat. Bacteria may be killed, enzymes may be inactivated, and insects may be killed or made incapable of reproduction. ("FDA Memo for Consumers," U. S. Food and Drug Administration.)

AFRICA

Mauritania

NEW 12-MILE LAW OPPOSED BY JAPAN

Mauritania's maritime and fishery law, which was scheduled to become effective March 15, 1967, is expected to seriously impair Japanese octopus fishing off the coast. Under the law, a straight base line will be drawn across the bay in northern Mauritania between Cape Blanc and Cape Temiris, and the territorial sea limit will extend seaward from that line. The territorial waters at some points would extend 40-50 nautical miles from the shoreline and shut out Japanese octopus fishing off the coast of Cape Blanc. The Japanese Government reportedly protested strongly to Mauritania. Japan stated that she cannot recognize Mauritania's unilateral extension of territorial waters. ("Suisan Keizai Shimbun," Feb. 22, 1967.)



Malagasy Republic

U.S.-BUILT SHRIMP VESSEL HEADS FOR MADAGASCAR

On March 23, the "Soavina I," the first of SIPAM's (Societe Industrielle de Peche a Madagascar) proposed fleet of shrimp vessels, arrived at Abidjan from Cayenne, French Guiana, en route to Majunga, Malagasy Republic. After minor repairs, she departed March 25 for Cape Town, South Africa, her only port call before Majunga, where she is scheduled to arrive in early May. This 65-foot Gulf of Mexico-type shrimp trawler was built at Rockport, Texas. She is powered with a 220-horsepower turbo-charged engine, has a daily freezing capacity of two tons, a storage capacity of 35 tons, and reportedly cost US\$94,000, complete, at Rockport.

First of a Proposed Fleet

An unconfirmed report said a Madagascar bank had built 50 shrimp boats for use in various parts of the world. It appears likely that Soavina I is the first of a proposed fleet. Whether other vessels are built would likely depend on results of the Madagascar operation.

As the first U. S.-built typical shrimp vessel to stop at Abidjan, Soavina I attracted considerable attention from local fishing interests. (Fishery Attaché, U. S. Embassy, Abidjan, March 29, 1967.)



Kenya

75% OF FISH PRODUCTION COMES FROM 5 LAKES

The Republic of Kenya's 300 miles of coastline yield only about 25 percent of the annual fish production; the balance comes from 5 major lakes. This information is contained in a new BCF leaflet. Kenya's rapidly growing population was estimated at 9.5 million in 1965. For the past 3 years, Kenya has imported annually 1,500 to 3,000 metric tons of fishery products.

The basic method of fishing is by fixed trap, using reeds and chicken wire. To develop and modernize the marine fisheries, a new company was formed--Kenya Inshore Fisheries. The leaflet covers fish production in Kenya for 1964; fresh-water fisheries in 5 major lakes, rivers and dams, and ponds; marine fisheries; shrimp development; Malindi fish market; lobsters; tuna; and cooperatives.

Note: FFL-109--"Kenya Fisheries 1966," is available free from the Branch of Foreign Fisheries, BCF, Room 8015, U. S. Department of the Interior, Washington, D. C. 20240.



Uganda

PLANS 40% FISH PRODUCTION INCREASE

Annual production of Uganda's fresh-water fisheries is about 70,000 tons, mostly tilapia (resembles American sunfish). Government plans call for an increase of over 40 percent by 1971 to 100,000 tons worth about US\$20,000,000, by increase in number and production of fish ponds, efficiency of lake fishing, and by improving marketing facilities.

Fish pond development will feature both hybrid tilapia and mirror carp, and the introduction of inboard-powered vessels up to

Uganda (Contd.):

35 feet long equipped either for trawling or gill-netting. Other topics discussed in a new BCF leaflet are: UN Special Fund Project, canned fish, frozen fillets, ice plants, and fishermen's cooperatives.

Note: FFL-108-"Uganda Fisheries, 1966," is available free from the Branch of Foreign Fisheries, BCF, Rm. 8015, U. S. Department of the Interior, Washington, D. C. 20240.



South-West Africa

1966 OUTPUT OF FISH MEAL, OIL, CANNED FISH

Production at Walvis Bay and Luderitz during 1966 was: fish meal, 204,519 short tons; fish oil, 37,846 long tons; canned fish, 133,304,090 pounds.

The catch and condition of snoek in 1966 were described as the best ever. The demand for salted snoek is high and prices good--making it more profitable to export than to can it. Canning of snoek is a considerably more complex and expensive process than canning of pilchards, for example. It is not economic under present market conditions. ("Barclay's Trade Review," Feb. 1967.)



South Africa

BRIGHT PROSPECTS FOR 1967 FISHING

The South African market can take over two million cases of canned pilchards this year, discloses the head of the organizations handling sales of fish meal, fish oil, and canned fish produced in South Africa. Last year the local market took over 1.6 million cases.

The canned fish markets this year tended toward increasing their off-take, especially in the local market. The industry's canning program therefore had been increased substantially over 1966. There were indications that the Philippine Government might permit imports of South African canned fish again this year.

The 1967 price for fish oil dropped from last year's. About half the anticipated production for this year already had been sold to the United Kingdom; the first shipment of about 12,000 long tons was to be taken at Walvis Bay and in the Republic during April. There also had been an increase in the domestic off-take of fish oil, and the industry was negotiating local sales. When local requirements are set, further exports will be negotiated.

The market for frozen spiny lobster in the U. S. remained healthy. The first 1967 shipment of about 20,000 cases of tails was scheduled for mid-March. A similar shipment was to be made about March 22.

Despite bad weather, catches of spiny lobsters have been good.

Fish Meal Market Normal

The market for fish meal was normal this year, although price was somewhat lower than 1966's but still better than in 1965. Last year's abnormal price, described as unhealthy for the industry, had not affected the market.

No difficulty is foreseen in disposing of this year's production. The industry stopped selling to more accurately establish the actual production figure. Sales were to traditional markets, which took the entire production; therefore, it was not necessary to open new markets. South Africa is responsible for 12-13 percent of the world fish-meal market.

Fishing in the Republic during January and February 1967 was good. The catch was about double the same period last year.

A meeting of the Fishmeal Exporters Organization was scheduled to be held in London in April. There, the whole question of fishmeal production and exports would be reviewed again in the light of the latest catches. ("Namib Times," Walvis Bay, South-West Africa, March 3, 1967.)



Senegal

TUNA LANDINGS

This year's tuna fishing season has not been very rewarding for Senegal. In mid-

Senegal (Contd.):

February, only 1,750 tons of albacore had been caught, compared to 2,450 tons landed last year by that date. Unseasonably warm weather is generally cited as the cause. Most of the 21 Basque and 22 Breton tuna boats fishing off the West African coast were inactive in the port of Dakar during March.

The largest tuna cannery, SAPAL, which employs up to 500 persons, suspended operations in early February after processing only 1,800 tons of albacore and skipjack ("lis-tao"). Company officials said the lack of tuna might prevent the firm from resuming production during the balance of this season, scheduled to end in mid-May. (U. S. Embassy, Dakar, Mar. 23, 1967.)



Sierra Leone

1966 CATCH DROPS SLIGHTLY

The 1966 Sierra Leone fisheries catch of about 27,000 metric tons was slightly less than 1965's. This was due largely to the repatriation of Ghanaian fishermen who operated from Sierra Leone. An encouraging aspect of the 1966 catch was the increased rate of landings per fisherman. About 18,600 tons were landed by local fishermen using canoes and traditional fishing methods; about 1,500 tons by trawlers. Also, about 6,900 tons of tuna were landed for reexport.

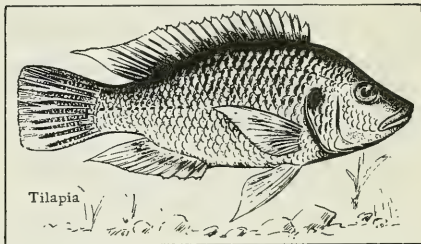
An international team of fisheries experts under the UN Development Program is expected to arrive soon to begin a five-year period of developing Sierra Leone's fishing industry, including a major survey of the sardine resources. (U. S. Embassy, Freetown, March 22, 1967.)



Congo

FISHERIES CONTINUE DECLINE

Congolese fish production has been declining since 1960, a new BCF leaflet states. The abandonment of most industrial fisheries on the eastern lakes, the smuggling of fish into neighboring states, and the lack of transport since independence decreased fresh-water fish production at least 50 percent by 1966. The Congolese Ministry of Agriculture estimates that 1966 fresh-water fish production was 72,000 metric tons. About 23,000 tons were harvested from lakes, largely those bordering the eastern Congo; 28,000 tons



were caught in the Congo River system; and the remainder (21,000 tons) from the rivers of the southeastern Congo, especially the Lualaba River. The most common fish found in the lakes is the tilapia, which resembles the American sunfish. The report also discusses maritime fisheries.

Note: FFL-120--"Congolese Fisheries, 1966," is available free from Branch of Foreign Fisheries, BCF, Room 8015, U. S. Department of the Interior, Washington, D. C. 20240.



ARTICLES

CLAM SURVEY OCEAN CITY, MARYLAND, TO CAPE CHARLES, VIRGINIA

By Phillip S. Parker*

During the summer of 1964 and the fall and winter of 1965, BCF made a clam survey off the coasts of Maryland and Virginia (Survey Area III). The purpose was to gather information on abundance, distribution, and size of surf clam (*Spisula solidissima*) and other species found with a potential for commercial use. Samples were taken at 1-mile intervals with a hydraulic jet dredge; 894 stations were surveyed. Catches of $\frac{1}{4}$ bushel or more per minute were made at 55 survey sites. Considerable variation in abundance, distribution, and size of surf clams occurred; these variations are related to bottom type and water depth. Limited beds of ocean quahogs (*Arctica islandica*) were found in some sections.

To maintain a steady production at present levels, the surf clam resource off the U. S. east coast is being subjected to increasing fishing pressure. Because of concern for future production, the fishery is now being investigated by several agencies: (1) BCF, (2) various state conservation departments, and (3) members of the surf clam industry. To determine the extent of the resource as a basis for future use, SCPA (Sea Clam Packers Association, an organization of members of the surf clam industry), working through the Oyster Institute of North America, initiated and supported a survey for sea clams that was done by BCF off New Jersey and Maryland coasts during summer 1963 (Parker, 1966).

The first survey covered only a small part of the area of interest, so SCPA and BCF agreed in fall 1963 to continue the work in the summer of 1964. SCPA provided funds to outfit BCF's research vessel "Rorqual" (fig. 1) for surf clamming, and BCF supplied the vessel, scientific personnel, and operating funds. From June 1-September 31, 1964, about half the proposed area had been surveyed.

In spring 1964, Congress authorized funds for a Sea Clam Research Program to be con-

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Notes: (1) This is Survey Area III.

(2) All statistics are in the appendix to reprint (Separate No. 791) of this article. For a free copy of the Separate, write to Office of Information, U. S. Department of the Interior, Fish and Wildlife Service, BCF, Washington, D. C. 20240.



Fig. 1 - The Bureau's research vessel Rorqual used during the 1964 surf clam survey in Area III.

ducted jointly by BCF's Exploratory Fishing and Gear Research Base at Gloucester, Mass., and the BCF Biological Laboratory at Oxford, Md. With these funds, 2 additional sea clam survey cruises by BCF's "Delaware" (fig. 2) completed the work in Area III (see Area of Operation). The first cruise was February 19-March 18; the second, November 12-24, 1965. This report covers all results of the survey in Area III.

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Fig. 2 - The Bureau's motor vessel Delaware used during the 1965 surf clam survey in Area III.

AREA OF OPERATION

A large, rectangular area off the coasts of Maryland and Virginia, lying roughly between Ocean City, Md., and Cape Charles, Va., is Area III for survey purposes (fig. 3). The 4 corners of the area are located:

Corner	Latitude N.	Longitude W.
Northeast	38°00'	74°30'
Southeast	37°15'	75°00'
Southwest	37°25'	75°24'
Northwest	38°09'	74°49'

The first surf clam survey agreement between BCF and SCPA called for surveying 4 areas off the New Jersey and Delaware coasts. However, with the later expansion of the exploratory shellfish program in BCF

Region III, we included all waters between Cape Hatteras, N.C., and Eastport, Maine, in overall survey area; we divided this area into 10 subareas designated survey areas. The survey areas extend from near shore to about the 30-fathom depth contour (fig. 4). New designating numbers were required for those areas already surveyed to allow each to fall into the logical numbering sequence of the new larger area (from Cape Hatteras, N.C., to Eastport, Maine). The areas originally numbered 1, 2, and 3 became 6, 5, and 7, respectively; area 4 remained 4.

GEAR

During February-March 1964, the Rorqual was converted for hydraulic jet dredging clam survey work. It is 65 feet long, has a 20-foot beam, and draws between 7 and 8 feet of water when fully loaded. Its aft deck is clear and provides a good working area.

A standard 40-inch hydraulic clam dredge was modified for survey work aboard the vessel. The changes were made primarily to reduce the escapement of many smaller clams that could have passed through the openings in the regular commercial dredge. These changes added steel screens to the sides, top, and bottom of the after cage; added steel bars between existing bars of the dredge's knife; and replaced the 3-inch steel rings of the chain bag with 1.5-inch rings.

During the 1965 Delaware cruises (65-2 and 65-10), modified 48-inch (wide) models of the regular commercial hydraulic dredge were used (fig. 5). Distances between steel

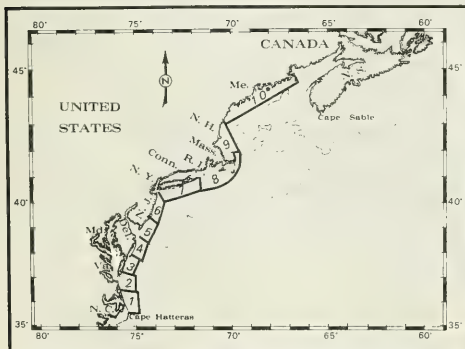


Fig. 4 - Chart of the eastern coast of the United States between Cape Hatteras, N.C. and Eastport, Me., showing the 10 survey areas.



Fig. 5 - Modified 48-inch hydraulic dredge used during the 1965 surf clam surveys.

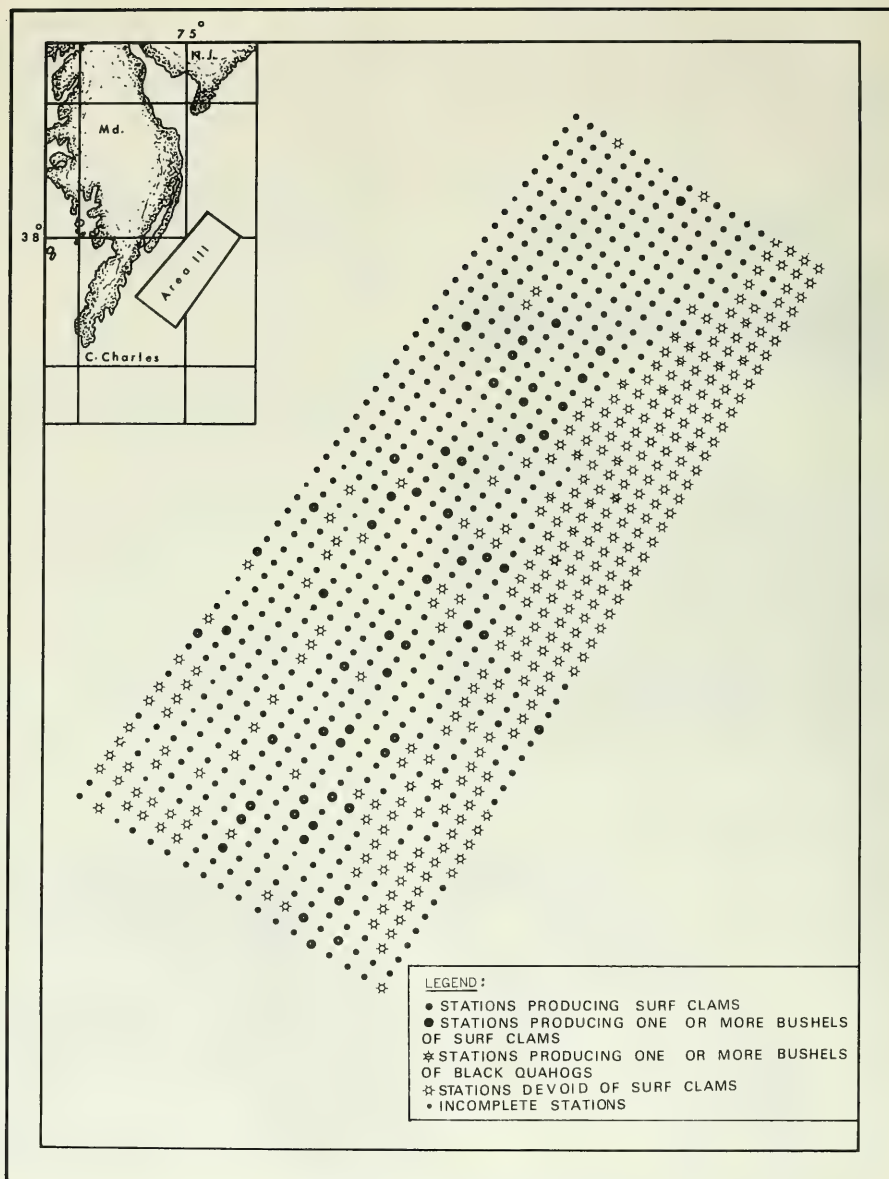


Fig. 3 - Chart of Area III showing survey stations.

slots of the dredge and the cage were reduced from 2 to 1 inch on the dredge used during cruise 65-2. The dredges had small clam retainer boxes built into the after cages for collecting very small specimens. During cruise 65-2, an odometer and thermistor probe were attached to the dredge to measure distance traveled by the dredge and to collect bottom temperatures.

Throughout each survey, an 1,800 gallon-per-minute centrifugal pump was used to furnish adequate water supply for operating the hydraulic dredge to depths of 150 feet. Water, at a deck pressure of 90 to 100 pounds per square inch, was furnished to the dredge manifold through 50-foot sections of either 5- or 6-inch inside diameter clam jetting hose. During cruise 65-2, two parallel lengths of 5-inch hoses were used, but before the cruise's end these were changed to a single 6-inch hose.

Water and pressure measurements obtained from instruments in the discharge line indicated the pump was pumping 1,775 gallons per minute of water through the manifold jets at 80 pounds per square inch manifold pressure (table 1--see note on p. 56) during dredging operations. This proved to be sufficient for successful dredging operations during all cruises.

We were unable to measure the water volume during tests made on the 6-inch hose because of a broken water meter. However, the volume of water (under the same manifold pressure) passing through the jets would be the same as that for an equal pressure measured during the tests on the 5-inch hoses--or about 1,625 gallons per minute for a manifold pressure of 70 pounds per square inch. The volume of flow through one or an equal number of jets would be the same for both tests at equal jet pressures.

In table 1, the pressure and water volume were calculated for an equivalent length of 6-inch hose (190 feet) as that used during the 5-inch tests. The data show that, for those pressures measured, there is no significant difference between performance of the two 190-foot sections of 5-inch hose and the one 190-foot section of 6-inch hose.

PROCEDURE

The same general procedure used during the 1963 survey (Parker, 1966) was followed in sampling Area III. Stations were spaced

about 1 mile apart along selected 1-mile spaced grid lines (Loran lines) running north and south through the area (fig. 1). During Rorqual cruise 64-2, 5-minute tows were made at a towing speed of about 1 knot.

The first sampling station was located in the northwest corner (Loran bearings: 1H5-3080, 1H4-3050). Loran-bearing lines spaced at 4 microsecond intervals formed the main north and south grid lines (Channel 1H5). Loran bearings at 12 microsecond intervals positioned the stations along each grid line (1H4). When each tow was completed, the dredge was hauled back and dumped. Clams were measured before the next sampling station was reached. In small catches, all clams were measured; in large catches, an adequate number were measured for length-frequency analysis. Water temperatures, bottom textures, and species composition of catches were recorded.

During Delaware cruises 65-2 and 65-10, the towing time was reduced to 4 minutes or less, depending on bottom type over which tow was being made. At each station, a sample was taken from material collected in the small clam retainer and frozen for later analyses. In addition, on Delaware cruise 65-10, 53 tows were extended to 20 minutes to simulate commercial fishing--to determine size of catch that commercial fishermen might expect.

RESULTS

In Area III, 947 survey sites were occupied. Of these, 894 were standard sampling tows of 4- or 5-minute duration; the remaining 53 were simulated commercial tows of 20-minute duration. Sampling tows during each cruise were: 303 tows during Rorqual cruise 64-2, 397 tows during Delaware cruise 65-2, and 194 tows during Delaware cruise 65-10.

Catches

Of the 894 standard sampling tows, 284 caught no surf clams; 610 took catches varying from one surf clam to 8 bushels of clams. Fifty-five catches contained one-quarter bushel or more of clams per minute of towing--considered the minimum catch rate necessary for commercial use (appendix--see note on p. 56).

Surf clams were taken in 97 percent (295 tows) of the 303 tows made during Rorqual

cruise 64-2. Surf clams were taken in only 68 percent (271 catches) of the 397 tows made during Delaware cruise 65-2, and in 22 percent (44 catches) of the 194 tows made during its cruise 65-10.

Several factors could have influenced these variations in catch rate. These include mechanical and other variants of biological significance, such as: (1) catch efficiency of dredges varied. During Rorqual cruise 64-2, the dredge used for sampling retained surf clams of smaller size than did the two dredges of the Delaware cruises. In sections of Area III containing only small size clams, the probability of catching surf clams in the Rorqual dredge was greater than when using the other dredges. (2) The population density of surf clams (table 2--see note on p. 56) appears to be related to water depth (as well as other factors). In the sections surveyed during Delaware cruises 65-2 and 65-10, the average water depth at the stations was greater than at the stations surveyed during Rorqual cruise 64-2. From the abundance-depth relation of previous work, one would expect the number of zero catches from the deep-water sections surveyed by the Delaware to be greater than from the shallower areas surveyed by the Rorqual; this was found to be true.

The lower three-quarters of grid line 10 was chosen for commercial sampling because of good catches there during the survey tows. Only 1 tow of the 53 simulated commercial tows failed to take any clams; 14 caught 5 bushels or more per tow, and the remaining 38 took 1 to 5 bushels. Catches agreed in clam size and distribution for the long tows and the sampling tows made along grid line 10. These results may indicate that the procedure of sampling along a 1-mile grid gives accurate results and adds some credence to the validity of this survey procedure for assessing a resource.

Clam Sizes

The size of surf clams varied from 0.4 to 7.4 inches (10 to 189 mm.). Clams less than 0.4 inch (10 mm.) undoubtedly occur in the area, but the dredges used were not designed to collect smaller clams.

The most abundant size group of clams taken in Area III was between 5.5 and 6.7 inches (fig. 6, table 3--see note on p. 56), the size preferred by the industry for proc-

essing. Surf clams over 6.7 inches were rare and clams less than 5.5 inches were abundant, but they were far fewer than those in the 5.5- to 6.7-inch group.

No general pattern was observed as to size distribution within individual catches (table 4--see note on p. 56). Some tows took only clams less than 4 inches, others took only those over 4 inches, but most caught both sizes.

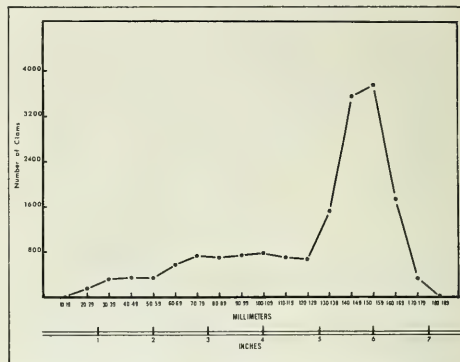


Fig. 6 - Length-frequency distribution of surf clams from Area III.

The length-frequency data collected in Area III do not conform with a normal length-frequency distribution. One would anticipate the number of clams in a smaller-size group to be considerably larger than the number in a larger-size group because of natural mortality. The curve (fig. 6) from our data shows that the number gradually increased from the 15-mm. (0.59-inch) to the 75-mm. (3.0-inch) class groups. After this, a small decrease occurs in the 85-mm. (3.3-inch) class, followed by an increase in the next two 10-mm. increments. The number then decreases to the 125-mm. (4.9-inch) class group, from which a very large increase takes place to the 155-mm. (6.1-inch) class group. The numbers in the following classes fall off sharply to the 185-mm. (7.3-inch) class.

As variable numbers of surf clams below 3.1 inches long pass through the bars of the dredge, the length-frequency curve plotted from our data does not represent truly the number of clams present below that size. The population of surf clams less than 3.1 inches is probably much greater than the data

show. All dredges used were constructed to catch and retain most, if not all, of the clams greater than 3.1 inches. Assuming nearly equal representation for all year classes contributing to the groups above 3.1 inches long, one would expect the number of clams between 3.1 and 5.5 inches to be greater than the numbers of 5.5 to 6.7 inches because of natural mortality.

This kind of population structure is possible if one or more dominant year classes set at infrequent intervals, as Ropes and Martin (1960) suggested for the hard-clam population of Nantucket Sound. However, this does not seem likely for the surf clam because 5.5- to 6.7-inch clams have dominated the population for the past several years. A better explanation may be that surf clams grow rapidly during the first few years of life, then grow slowly for an extended period. Many rapidly growing small clams would enter the slow-growing period, so the number of large clams present would represent the cumulative total of a number of year classes, not a single year class. When the problem of determining the age of surf clams is solved, it may help to answer this question.

Bottom Types

A relation was found between the mean number of clams caught and the bottom type fished (table 5--see note on p. 56). The bottom in Area III was divided into 4 general classifications: (1) sand, (2) gravel, or a combination of gravel and sand, (3) mud, clay, or a mixture of both, and (4) unknown (tows taken where a bottom sample was not obtained). Of the general types identifiable from contents of the dredge, 65 percent were classified sandy, 14 percent gravel, 9 percent mud-clay, and 12 percent unknown. The types arranged with most productive listed first are: (1) gravel, (2) sand, (3) mud-clay. The mean catch from stations with gravel bottom was $2\frac{1}{2}$ times that from sand, and $5\frac{1}{2}$ times that from mud-clay.

Water Depths

In Area III, depths of water fished ranged from 7 to 28 fathoms. The best catches were made between 14 and 18 fathoms (fig. 7, table 2). These data show that the average number in the catches from 10 to 13 fathoms was fairly constant. The catch rate increased steadily between 14 and 18 fathoms, then declined to zero at 25 fathoms.



Fig. 7 - Depth distribution of surf clams in Area III.

Data analyzed according to depth increments seem to indicate some relation between depth of water and number of clams caught.

Catch rates by water depth and type of bottom are shown in figure 8 and table 6 (see note on p. 56). These data indicate that for each bottom sediment the best catches were made in those sections where depth varied between 15 and 19 fathoms.

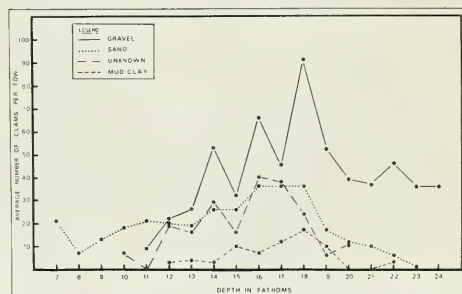


Fig. 8 - Relation of catch rate to water depth and different bottom sediments in Area III.

Populations

Most catches were less than 1 bushel. Generally, the density of clam population was

related to the depth of water and type of bottom sediments. Other biological and physical factors--such as spawning, mortality, current, and temperature--probably influence the population structure. The best catches were taken between the 4th grid line and the 14th grid line, extending from the southern boundary of Area III northward for about 40 miles.

Along the first 4 inshore grid lines (1, 2, 3, and 4), only 6 stations had a catch equaling or exceeding $\frac{1}{4}$ bushel per minute. Although these 4 grid lines included only 11 percent of the 55 better yielding ($\frac{1}{4}$ bushel per minute) stations, the inshore area included 22 percent of the total area. In this section, the population of surf clams was fairly dense in scattered spots; however, they did not equal the density in the better-producing central area described below. The greater percentages of bottom sediments were mud and clay in the shoal inshore area.

In the central section of Area III, which includes the 8 grid lines 5 to 12, the population density was much greater than in either inshore or far offshore sections. The area defined by these 8 grid lines, although including only 45 percent of total area, produced 78 percent of the tows taking $\frac{1}{4}$ bushel or more of clams per minute. The greatest percentages of high-yielding bottom sediments are within this section, overlain by the assumed optimum water depths. All stations that produced catches of 1 bushel or more per minute (up to maximum of 2 bushels) were located within this section. The best possibility for commercial production in Area III is here.

The 6 far offshore grid lines (13 to 18 inclusive), lying beyond the other 2 sections (fig. 1), delimit the remaining 33 percent of the 926 square miles in Area III; they produced the remaining 11 percent of the 55 stations with good catches. The average depth in the section was much greater than in the other two; most of it is covered by 20 to 28 fathoms of water. Most zero catches came from this section. No surf clams were taken deeper than 24 fathoms. The density of surf clams between 20 and 25 fathoms was considerably less than for under 20 fathoms.

The catch rate reflects the surf clam population available to the dredge. Catch data show that the number of clams for any unit of sea bottom is small. At an average tow-

ing speed of 1.25 miles per hour, 1,760 square feet of bottom could be covered during a 4-minute tow with a 48-inch dredge. Assume that all clams available were retained by the dredge, and use 60 as the number of commercial size clams needed to fill a bushel measure. At a catch rate of 0.25 bushel per 4-minute tow, there would be an average of one clam per 116 square feet of bottom area. At a catch rate of 1 bushel per 4-minute tow, one clam would be present per 30 square feet of bottom. A density of one clam per square foot of bottom would give a catch rate of 30 bushels per 4-minute tow, or about 150 bushels per 20-minute commercial tow. To our knowledge, this never has been reached during commercial fishing operations. The same process can be used for smaller size clams after adjusting the numbers of individuals in the bushel measure.

Within any area, the density of clams may vary considerably from subsection to subsection owing to spawning mortality, random distribution of the young clam, effects of ocean currents, varying bottom sediments, depth of water, natural mortality, predation, and possibly migration of the clams. While the dredge is operating, it will pass through areas of dense, good, fair, poor, and zero populations of clams in a direct relation to the cumulative effects that environmental factors have had on the establishment of clam populations. Although these factors also affect the population structure of every small geographical subsection, the overall effect is more noticeable in larger areas, such as the middle section of Area III, where the depth and bottom sediments seem to have established the best surf clam populations in the area.

OCEAN QUAHOGS

Ocean quahogs (*Arctica islandica*) were found in varying numbers--from 1 to 879 per tow at 220 of the 894 survey sites in Area III. The best catches were made where the depth varied between 20 and 25 fathoms (fig. 9, table 2). In shallower waters, they were mixed occasionally with surf clams, but they were never the dominant species in the catch. Beyond 25 fathoms they occurred in intermediate numbers.

Geographically, the best catches of ocean quahogs were along the 25-fathom contour in the area's northeast section, where the bottom generally was quite flat and was com-

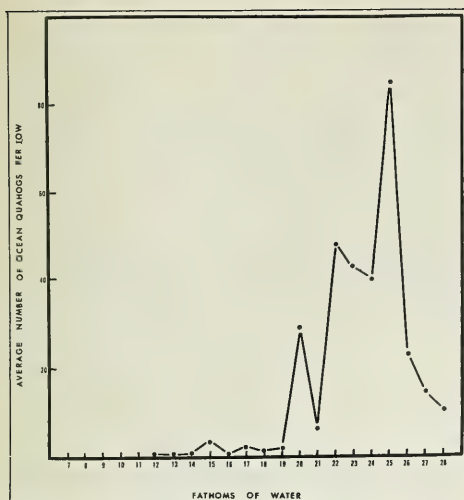


Fig. 9 - Depth distribution of ocean quahogs in Area III.

posed mostly of hard sand. Southward, as the water became shallower, the catches became smaller.

The production potential for this species is good in those sections where they are most abundant (table 7--see note on p. 56). From these sections, commercial fishermen can expect catches of about 15 bushels per 20-minute tow, which is sufficient for commercial exploitation.

PROBLEM OF THE CLAM FISHERY

Harry J. Turner, Jr. wrote in 1953: "A fundamental problem that besets (clam fishery) is that mollusks are extremely erratic in their propagation and variable in their growth and survival. Isolated localities may be phenomenally productive at one time and completely barren for a long period. The gaps in our present knowledge of the chain of events that bring about a mature crop of shellfish are so extensive that the actual occurrence of such a crop appears almost accidental. During the general populations development pattern common to most clam species there occurs a large number of interacting physical and biological factors affecting the survival. The problem of achieving maximum production involves the determination of these factors and assessment of their individual relative importance in the hope that certain factors can either be regulated

or controlled to expand the actual production toward the theoretical potential."

Before any intelligent proposal could be made for the establishment of a management program for Area III, most, if not all, factors influencing any surf clam population must be investigated and evaluated. One of the most important factors in the life history of any living organism is its reproduction. In Area III, it seems that some relation exists between the number of large clams (over 4 inches) and the number of smaller surf clams (less than 4 inches) along each separate grid line (table 8--see note on p. 56). Turner (1953) quotes previous authorities as indicating that the reproductive products of one sex may influence the spawning reaction of others so that a chain reaction may be set off. If this situation applies to surf clams, then in those sections of Area III where the spawning populations are concentrated, enormous amounts of spat and eggs could be released into the surrounding water at one time. Based on Turner's (1953) assumption that each mature female produces a million or more eggs annually, the number of young clams available for setting and growth to maturity, even in relatively sparsely populated areas, could be tremendous.

The concentration of small clams as well as large clams in an area add some support to Turner's hypothesis (1953) that, during the surf clams' free-swimming (veliger) stage, their movement may be quite restricted. With increased knowledge of the larval stages and physiology of the surf clam, it might be possible to locate stocks of spawning surf clams in areas of greatest potential.

In any large sea clam producing area, bottom sediment concentrations may affect the size and extent of clam populations. Possibly because of these physical factors, the better concentrations of surf clams are in the central section of Area III. The coarse sand and gravel substrate of this section evidently are ideal habitat for surf clam growth and survival. Although these types of sediments occur in other sections of Area III, they never occur over as broad an area. Of course, it must be remembered that other factors also affect the populations in the central and other sections of Area III.

Turner (1949) states that in Massachusetts the growth of the surf clam varies with locality and year to year, but it is more uniform

than other commercial mollusks. A surf clam may reach $3\frac{1}{2}$ inches in $2\frac{1}{2}$ years; it reaches 4 inches in 5 years. Clams 5 to 6 inches are estimated to be at least 10 years old.

Belding (1910) stated that the surf clam may reach sexual maturity at 1 year, but the first important spawning season occurs in its second year. By 5 years, it would be about 4 inches long.

Studies to determine the age and growth of the surf clam are now under way by the BCF Biological Laboratory, Oxford, Md. Past indications are that the life span of the surf clam is fairly long and growth is rapid only during the first few years. Probably the growth rate of the surf clam in Area III gradually decreases (from the very rapid early growth rate) until it reaches about 6.5 inches, when very slow growth occurs for the remainder of its life span. Only a few clams reach the maximum length of over 7 inches.

SUMMARY

A surf clam survey with 894 sampling stations and 53 simulated commercial tows was made between Ocean City, Md., and Cape Charles, Va. BCF's Rorqual was used during summer 1964 and BCF's Delaware during

winter-fall 1965. Originally, the area was designed as Area V, but now has been redesignated Area III.

Considerable variation was observed in size, abundance, and distribution of surf clams. A catch rate of $\frac{1}{4}$ bushel per minute was obtained at only 55 survey sites. Clams were taken at 610 stations; zero catches occurred at 284 sites.

No surf clams less than 0.4 inch (10 mm.) were caught; the 5.5- to 6.7-inch length group dominated the length-frequency curve. A relation was found between number of small and large clams along a single grid line.

Although gravel bottom was not predominant, it produced the best catches of surf clams; sandy and mud-clay bottom yielded smaller amounts.

A close relation was observed between size of catch and water depths; optimum depths occurred between 14 and 18 fathoms.

Simulated commercial tows indicate our sampling method is reliable for assessing surf clam resource.

Smaller and fewer beds of ocean quahogs were found in Area III than in Areas I and IV.

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THE WEST COAST'S SEAWEED INDUSTRY

By Norman W. Durrant*

Webster defines a weed as any undesired, uncultivated plant that grows in profusion and crowds out a desired crop. The term "seaweed" is, therefore, a gross misnomer since many so-called seaweeds are highly useful plants that yield a number of important products. Those most commonly used are the red and brown marine algae.

The earliest records about the use of marine algae are found in Chinese writings of the first century. About 1660, the Chinese introduced into Japan dried algae, which are used as food in many ways. The Chinese and Japanese continue to eat more algae than do any other people. The Japanese eat their seaweeds as regularly as we in the United States eat our tomatoes and lettuce.

Although algae have been harvested for centuries throughout the world, the industry as we know it today stems from the two world wars. During the first, potash and other chemicals were not obtainable from Germany, and both England and the United States turned to the mighty seaweed known as kelp to supply this need. This gave birth to a major industry in southern California. Between 1916 and 1920, over 190,000 tons of kelp were taken. At the close of the war, cheaper sources of chemicals became available, and the kelp industry of California declined.

With the outbreak of World War II, a shortage of chemicals again developed; however, this time the need was for alginates (an extract from kelp) and agar. The various chemicals that had been needed in World War I were not in short supply. The 1940's saw a marked expansion in both harvesting of algae and research to improve manufacturing methods. The purposes of this increased activity were to develop new products and new sources of raw material.

Through many hardships, the U. S. seaweed industry has developed into an important and stable contributor of many products for the food, pharmaceutical, and industrial fields. It is active in New England and on the West Coast.

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AGAR

The commercial production of agar began in the United States in 1919, when Chokichi Matsuoka started a business at Tropic, Calif., now part of Glendale. He failed because he could not compete successfully with low-cost imported agar and sold his business in 1923.

In 1940, American Agar and Chemical Company of San Diego, Calif., decided to take up the challenge of developing an agar industry. This effort was spurred by the realization that in a war with Japan the total U. S. supply of vital agar would be cut off.

World War II stressed particularly the need for bacteriological agar. It is the only colloid with characteristics perfectly suited to the development of most microorganisms at temperatures higher or lower or equal to that of the human body. When the war deprived the allied nations of Japanese agar, the U. S. War Production Board alleviated the critical shortage by (1) commandeering and stockpiling all available supplies, and (2) encouraging U. S. companies to harvest red algae and produce agar. American Agar and Chemical Company produced over 90 percent of the entire allied supply; the remainder came from 8 quickly established companies that failed by the end of the war.

The American Agar and Chemical Company is now one of the world's largest producers of agar and the only U. S. producer. It produces about 1,000 pounds of finished product per day; the high quality has been made possible through a strong research and quality control program.

Agar Has Many Uses

The agar sells for \$4.00 to \$6.00 per pound and about 80 percent of production is distributed primarily to manufacturers of microbiological culture media. It also is used in laxatives because it absorbs and holds water--thus becoming a lubricant and mild stimulant to the intestinal tract. In dentistry, it is one

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of the best materials for making impression molds. Agar also has many uses in food manufacture. It retains moisture and so reduces the rate at which bread and pasteries dry out. In canned meats and fish, it is more stable than animal gelatin. In candies and malted milks, it serves as a stabilizer.

One of the primary problems in this industry still is improvement in harvesting of raw seaweed products for the production of agar. Primitive methods must still be used to harvest the seaweed. Some weeds can be reached with rakes from rowboats or can be gathered by waders at low tide; skin divers, though, account for more. In Mexican waters, harvesting must be done by divers in head-to-toe pressure suits. The high cost of labor in the United States discourages the extensive harvesting of seaweed for agar off our shores. Nearly all of the raw materials for the industry is imported from such areas as Mexico, South Africa, Egypt, and South America.

Several years ago, the American Agar and Chemical Company attempted unsuccessfully to mechanize the harvesting of the agar weed. Until some means of mechanical harvesting can be developed, it is unlikely that significant amounts of seaweed will be gathered off the U. S. coast for production of agar. This country will have to continue to depend on imported raw material.

KELP PRODUCTS

By far the largest producer of seaweed products on the West Coast is the Kelco Company. It produces algin from *Macrocystis pyrifera*, a species of kelp growing in the offshore waters of the Pacific coast. The many algin products available today are the result of an intensive research, development, and marketing program extending over the past 35 years. Although algin was discovered as a constituent of kelp in 1880, the first successful commercial development was begun in 1929, when Kelco was established in San Diego, Calif.

Algin has many unique properties that make it valuable to the food, industrial, and pharmaceutical fields. Like agar, it is a colloidal substance with the ability to absorb large quantities of water. When a tablespoon of algin is dissolved in one quart of water, the water becomes so thick it can hardly be poured. This unique property is particularly useful in the ice cream industry. The addition

of algin to ice cream prevents the water in ice cream from forming coarse ice crystals while being frozen, and the result is a smoothly textured product. Another use is its addition to icing on cup cakes, where it holds the moisture and prevents the icing from sticking to the wrapper.

Algin Has Over 100 Uses

Algin also has unique suspending, stabilizing, emulsifying, gel-producing, film-forming and colloidal properties that make it valuable in other processes. Algin has more than 100 current uses in the pharmaceutical, food, rubber, textile, dairy, adhesive, paper, and other industries.

The West Coast algin industry competes with many natural and synthetic materials, such as gelatin, methyl and carboxymethyl celluloses, gum arabic, gum karaya, gum tragacanth, starches, pectin, polyvinyl pyrrolidone, and polyacrylamides. Despite this increasing competition, alginates are being used more in the United States and abroad. The cost of algin (about \$2.00 per pound) is slightly higher than many synthetic colloids, but it is often preferred for its unique properties.

The West Coast kelp industry is highly research oriented. Its scientists are continually seeking new kelp products that will be useful to industry and, at the same time, provide an outlet for natural byproducts of the algin industry. The Kelco Company is now establishing a production unit to extract and process mannitol from kelp. It has been determined that mannitol, a white crystalline alcohol, may be produced from seaweed at almost one-third the cost of making synthetic mannitol. Established markets for this chemical already exist in explosives, electrical industry, paint making, and in the pharmaceutical industry. It is also used in the manufacture of some dietary sweets.

In addition to being used for producing alginates, this giant kelp is used in animal feed. Two Los Angeles area companies, Philip R. Park, Inc., and Kopco, Inc., process kelp for use in various animal feed formulas.

The harvested kelp for animal feed is unloaded into a large hopper and slides into a chopping machine to be ground up and pumped into a large storage tank. It is then pumped

into huge rotary gas-flame dryers, and most of the 90 percent water content is evaporated. Of the remaining 10 percent, one-third is minerals. It comes out of the dryers in the form of tiny, dark-green flakes with a pleasant, salty taste. At this stage, it is valued at about \$150 per ton. It is then sacked and sent to various feed manufacturers and blended into animal food products. The meal is used extensively for stockfeed throughout the United States, especially in the large agricultural areas of the Middle West.

Besides processing kelp for animal feed, Philip R. Park, Inc., processes various dietary products for human consumption. These include kelp tablets, powder, and an all-purpose seasoning called "SeaZun." These items are used primarily for iodine, mineral, and vitamin supplementation to the diet.

HARVESTING

Unlike agar seaweed, kelp is harvested by a highly mechanized operation. The giant kelp growing in deeper water off the Southern California coast lends itself to mechanical harvesting, which has been used since World War I. Here, a large barge or ship equipped with adjustable mowing sickles moves slowly over the kelp bed. The sickles cut the kelp and pass it to an endless chain conveyor or apron that carries the cut fronds onto the boat. The sickles are set to cut 3 or 4 feet below the surface. This cutting of plants near the surface enables sunlight to penetrate to the younger plants below, stimulating them to grow vigorously. New shoots soon reach the surface and permit the area to be reharvested in 3 to 4 months. The harvesting boats used in the West Coast kelp beds hold 250 to 500 tons of wet kelp.

Many persons believe that kelp harvesting destroys other valuable sea life. This is not true. Marine biologists have established that harvesting kelp does not interfere with other valuable sea life, relatively little of which depends on kelp for shelter or food. The few organisms that do live in the kelp are found in the middle or lower sections of the beds.

California Regulates Cutting

The California Fish and Game Commission strictly regulates the depth of cutting and other harvesting procedures. Only mature beds are cut. When they are ready for

harvesting, the kelp plants have a high percentage of mature fronds that grow thickly on the surface of the sea. Most of the mature fronds, if left alone, would slough off and break loose from the parent plant to rot in the water or drift up on the nearest beach.

Harvesting may be compared to a massive pruning of the kelp bed. Many old stems are removed in favor of newer, healthier branches, just as in old land plants. The seaweed are not damaged permanently. The overall condition of the plant from the bottom to the surface of the water is improved because the growth of many new fronds has been promoted.

Kelp beds are not free from conditions that curtail growth or destroy large portions of the beds. For example, "red tide," composed of minute marine organisms, can cloud the waters and deprive the kelp of energy-giving sunlight. A proliferation of coastal atomic power plants intensifies another problem. Sea water used to cool reactors is returned to the ocean. These large discharges can raise ocean temperatures above the level at which kelp can survive. In an effort to solve this problem, studies are underway on the feasibility of transplanting to the affected areas temperature-resistant kelp found off Mexico.

Sea Urchin A Threat To Kelp

One of the most serious problems in the kelp industry is the rapid depletion of kelp beds due to the small but voracious sea urchin. This spiny creature can sever a kelp plant from its holdfast anchorage. This happens quite often because urchin "fronts"—up to 100 urchins per square yard—move across a kelp forest, eating and devastating it. Normally, the kelp can regenerate itself because the urchins move on at about a yard a day. Unfortunately, the urchins in the highly infected areas remain sedentary.



Sea urchin.

Realizing the seriousness of this problem, a Kelp Habitat Improvement Project began operations in September 1962. The project was supported during the first 2 years by grants from the Kelco Company and is now being supplemented by a grant from the San Diego County Fish and Game Commission.

The purpose is to continue the research developed during a large-scale study of the kelp beds, first by the University of California's Institute of Marine Resources, and later by the California Institute of Technology.

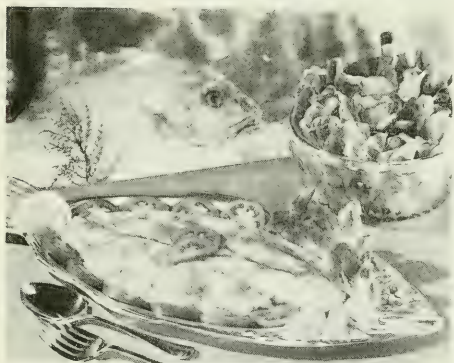
These studies were aimed initially at finding an agent for exterminating the sea urchin. Long ago, fur hunters had exterminated the sea otter in the area, the one major predator able to utilize the sea urchin as food. The French control populations of urchins by

eating them, but they are not popular in America. Fencing off urchins from the kelp beds was considered--but urchins can climb fences. After considerable trial and error, quicklime was tried on some urchins in the laboratory. This treatment proved effective, while remaining harmless to valuable fish species in the area. The project's researchers hope that a comprehensive liming program, coupled with extensive transplanting, will lead to the rejuvenation of many depleted kelp beds.



DIET? TRY IT! -- WITH SEAFOODS

Enjoy dieting? Yes, you can. Diet meals that emphasize fish and shellfish will give you added pep and energy while the pounds melt away. Why? Because fish and shellfish are low in calories but contain high quality, easily digested protein; vitamins; and minerals so necessary for a "top of the world" feeling.



Fish and shellfish have a delicate, distinctive flavor and there are so many varieties to choose from. Snapper is considered one of the choicest of all and in this recipe it is served with real imagination. Marinated in and basted with a tangy, low calorie sauce, the snapper is broiled to appetizing perfection. Spicy Snapper will be a favorite with everyone, including the dieters.

This recipe is from a new, 16-page, full-color, diet booklet, Seafood Slimmers, just released by the United States Department of the Interior's Bureau of Commercial Fisheries. It is available for 25¢ from the Superintendent of Documents, Washington, D. C. 20402.

SPICY SNAPPER

2 pounds snapper fillets or other
fish fillets, fresh or frozen
 $\frac{2}{3}$ cup tomato juice
3 tablespoons vinegar

2 tablespoons salad oil
1 envelope ($\frac{5}{8}$ ounce) old
fashioned French dressing mix

Thaw frozen fillets. Skin fillets and cut into serving-size portions. Place fish in a single layer in a shallow baking dish. Combine remaining ingredients and mix thoroughly. Pour sauce over fish and let stand for 30 minutes, turning once. Remove fish, reserving sauce for basting. Place fish on a well-greased broiler pan. Broil about 4 inches from source of heat for 4 to 5 minutes. Turn carefully and brush with sauce. Broil 4 to 5 minutes longer or until fish flakes easily when tested with a fork. Serves 6.

Approximately 130 calories in each serving.

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NOTE: The title of Travis D. Love's article in the April 1967 CFR was distorted when shortened. The full title, as it will appear in the reprints, is: "Survey of the Sun-Dried-Shrimp Industry of the North Central Gulf of Mexico."



UNITED STATES DEPARTMENT OF THE INTERIOR

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Let's
Cook
Fish!

New

in full color
from the...

**BUREAU OF
COMMERCIAL
FISHERIES**

Fish cookery is easy; the difficulty lies in not knowing how. To help eliminate this problem, the United States Department of Interior's Bureau of Commercial Fisheries has produced *Let's Cook Fish*, a 56-page, full-color publication devoted to consumer education in all phases of fish cookery.

The booklet has explanations and full-color drawings of the market forms of fish; tells how to select and maintain high quality fresh, frozen, and canned fish; how much to buy per serving of all market types (to help the consumer spend food dollars wisely); and includes explanations and drawings for cleaning, dressing, storing, thawing, and cooking fish.

The cooking section tells how to bake, broil, charcoal broil, pan fry, oven fry, deep-fat fry, poach, and steam fish. Selected basic recipes accompany each method of preparation. Also included is a two-page, detailed timetable in easy-to-follow chart form for cooking fish, and a list of tasty, colorful garnishes. Descriptive illustrations and how-to-serve food photographs add color and gaiety to this informative book.

Single copies may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402, for 60 cents. Purchases of 100 or more sent to one address receive a 25-percent reduction in cost.

COMMERCIAL FISHERIES *Review*

VOL. 29, NO. 6

JUNE 1967

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Fishes



COVER: Tuna fishing boat off Southern California encounters
"Chubasco"--a whirlwind storm. (Photo: USIA/National
Archives)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.



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Gloucester, Mass.

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Cleaning fish aboard Gloucester, Mass., gill netter. (Photo: USIA/National Archives)

UNITED STATES

U. S. Seeks Contractor for FPC Pilot Plant

The Department of the Interior has invited proposals from private contractors to build the Government's first pilot plant for producing fish protein concentrate (FPC). The plant is intended to show the practicability of manufacturing FPC by using the BCF isopropyl-alcohol process--and to serve as a guide to private companies in designing and building full-scale plants.

The deadline for the proposals is July 10. They must meet BCF standards and involve a plant able to process 50 tons of raw fish in 24 hours. The FPC produced in pilot plant will be used in studies of ways to make the concentrate part of the foods consumed in the U. S. and abroad.

BCF plans to award the contract during the summer and to have the plant working by Spring 1968.

The Pacific Northwest has been picked as the location for the pilot plant because BCF exploration off the coast found vast amounts of hake, which are used in the BCF process. The exact spot for the plant waits on the selection of a contractor.

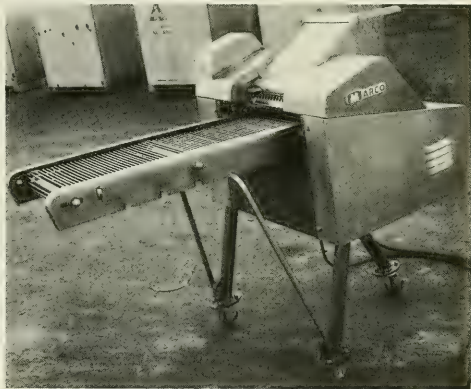
President Johnson's 1968 budget for Interior Department asks for \$1 million for design and construction of the plant and \$700,000 to operate and maintain it and for related research.



A Machine to Skin Fish

A portable machine that can skin "almost any size fish--up to 9 inches wide and any length," its Seattle, Wash., makers say, has been put on the market. It sells for \$4,750, and was demonstrated recently by the Marine Construction & Design Co., E. L. Grimes, of the company's fisheries-development division, says: "It is a simple and economical machine designed to meet the needs of the small and medium-sized producer."

The filleted fish, tail first, enters the aluminum-stainless steel machine. An adjustable knife blade in a chute catches, clamps down, and strips the skin as the fish moves down onto a conveyor. Grimes explains: "It strips rather than cuts. It leaves the white membrane under the skin, allowing for extra recovery of food." The blade can be adjusted to the skin thickness.



He points out that the machine will handle large halibut fillets without problems. "It even handles dogfish, which is extremely difficult to skin by hand. At first I didn't think the machine could process it." The Canadians provide much dogfish for England's famous institution--"fish 'n chips." Shark is becoming more popular in Europe, and it too can be skinned by the machine.

Grimes stated that the machine can skin as many as 75 small fillets per minute. "In Canada, where we have sold several of these, they have found 2 persons are needed to feed the machine to keep up with its capacity speed."

The machine is run by a $1\frac{1}{2}$ -horsepower motor and needs 220-volt electricity and a $\frac{1}{2}$ -inch water supply.



Sub Studies Bottom of Lake Michigan

For 2 weeks this month, Dr. David C. Chandler of the University of Michigan will dive 920 feet to the bottom of Lake Michigan in a space craft-shaped midget sub, the "Star II." "There are 300-foot-deep canyons in the bottom of Lake Michigan, and we want to get a good look at them," explained Dr. Chandler, an aquatic biologist and director of the University's Great Lakes Research Division. The university leased the 17.7-foot, 4.7-ton sub from the General Dynamics Corporation to determine whether a sub is a useful research tool. If its 17 scheduled dives prove valuable, Dr. Chandler added, he may conduct later comprehensive underwater explorations of the Great Lakes. His current project involves the first use of a sub in these waters.

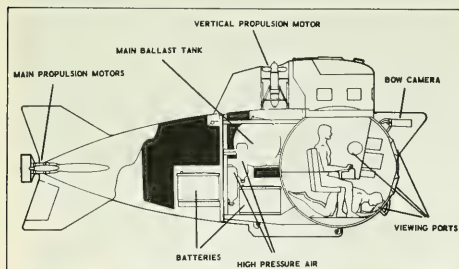


Fig. 1 - Cutaway of Star II.

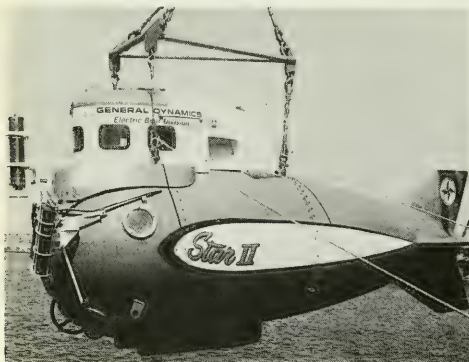


Fig. 2 - Star II.

Dr. Chandler has watched underwater research with subs off the Pacific Coast but has never dived in a sub. He will be accompanied by an engineer.

A Geologic Probe

He said the first dive would concentrate on geologic probes: "We know a lot about rock formations in Wisconsin and Michigan on either side of the lake, but Lake Michigan itself is a big gap. We hope to learn more about the nature of the lake basin."

The researchers will observe and take samples of the face of rock ledges using out-board equipment. (The sub has observation portholes and carries 250 pounds of scientific apparatus.) They will study the life of lake fish, their food, and bottom sediments.

To date, scientists have explored the Great Lakes mostly by lowering instruments to obtain samples, underwater TV and cameras--and through the observations of SCUBA divers who went down to about 200 feet.

Coast Guard Lends A Vessel

Dr. Chandler's efforts are being backed up by the U. S. Coast Guard, which has a



Fig. 3 - U. S. Coast Guard tender Woodbine (WLB-289).
(Photo: U.S. Coast Guard)

policy of assisting scientists in Great Lakes research. It is making available the cutter "Woodbine," a sea-going buoy tender that will lower and retrieve the Star II.



OCEANOGRAPHY

Soviet Scientist Joins "Oceanographer"

A Soviet scientist, Alexei Metalnikov, joined U. S. scientists aboard the Oceanographer when it stopped over in Odessa on the Black Sea last month. The U. S. Embassy said he would travel as a "guest scientist" on a scientific voyage to India. The Oceanographer is on a round-the-world voyage. While in Odessa, it held openhouse.



The U. S. Coast & Geodetic Survey research vessel Oceanographer. (ESSA photo)

The vessel is attached to the U. S. Commerce Department's Environmental Science Services Administration.



Most Extensive Survey of Massachusetts Coast Under Way

The Coast and Geodetic Survey began work last month off Ipswich on a 5-year hydrographic survey of the Massachusetts coast from Cape Ann to Cape Cod. It will be the most extensive survey of these waters in 100 years.



Fig. 1 - The U. S. Coast & Geodetic Survey ship "Explorer."

The USC&GS ship "Explorer" operating out of Boston will conduct the survey until October, and resume each year until the job is done. The 1,900-ton, 219-foot vessel carries 14 officers and 69 crew and is equipped with the most modern electronic devices for hydrographic surveying.

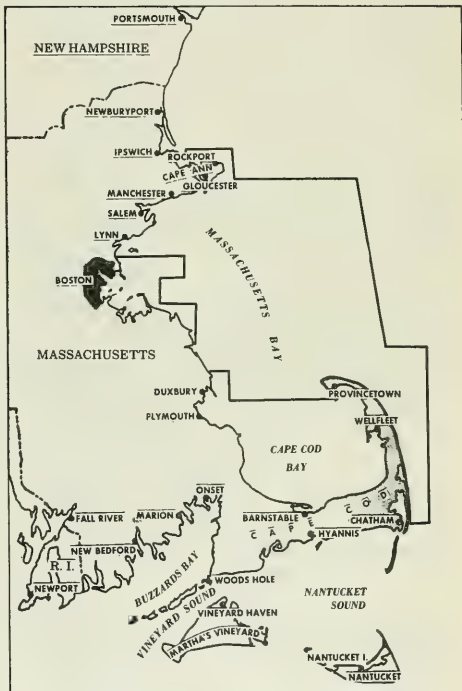


Fig. 2 - Box indicates area of Massachusetts coast to be surveyed by Coast & Geodetic Survey, ESSA, as part of a 5-year program.

The survey will not cover recently surveyed Cape Cod Bay or the waters in and around Boston Harbor, except the Winthrop area extending north of President Roads. But the survey will include all other harbors from Cape Ann to Cape Cod, including Rockport, Gloucester, Manchester, Beverly, and Salem.

Area of 1,350 Square Miles

The survey will cover about 1,350 square nautical miles--from 4-5 miles offshore to

20-25 miles--where it will merge with surveys already completed over the continental shelf.

The data obtained will be incorporated into a new, small, craft chart (613-SC) of the area from Boston to Portsmouth, N. H.; this will probably be issued in 1968. About 20 existing charts also will be updated to include the latest data from the survey and data from other U. S. agencies. The first revised chart probably will be issued in March 1968. Major navigational hazards discovered will be incorporated in chartlets; these will serve as interim charts for individual areas until the revised overall charts are prepared.

In conducting the survey, Explorer's hydrographers operate both from the ship and from launches. They measure and record depths along the coast with an electronic echo-sounder that measures the time required for a sound wave, produced in the vessel's hull, to reach bottom and for its echo to return. The return echo is recorded on a permanent graph at rapid intervals. These form a continuous profile of the sea floor as the vessel covers a predetermined course. The vessel is navigated over courses following a strict pattern for thorough coverage, and the hydrographers obtain the shape and slope of submerged elevations and depths.

To put these submerged elevations and depths on nautical charts, the hydrographers determine the exact location of the moving vessel at selected intervals while depth soundings are being recorded.



Pacific Ocean Atlas Is Sent to Printer

The "Oceanographic Atlas of the Pacific Ocean" has been delivered to the University of Hawaii Press. Publication is scheduled for the coming year. The atlas is the work of Richard A. Barkley, oceanographer at the BCF Biological Laboratory in Honolulu, who spent 5 years preparing it.

John C. Marr, BCF Area Director, explains that the atlas resulted from oceanographic station data collected in the Pacific Ocean during the past 50 years by 28 laboratories and institutions of 10 nations and assembled, summarized, analyzed, and charted at the laboratory.

Previously, this great collection of data--3 million measurements of temperature, salinity, dissolved oxygen, and depth--had been published and used piecemeal on a regional basis. At most, a small percent had been selected and processed by hand to produce a few oceanwide charts. But the advent of high-speed electronic computers made it physically and economically possible, for the first time, to use all of the data in one definitive compilation. The atlas--in 156 charts and graphs to be published in one volume--makes all this information available to scientists, fishermen, mariners, and anyone who wants information on the physical and chemical characteristics of the Pacific Ocean.

Has Remarkable Detail

Every effort was made to retain all usable detail on the final published charts showing distributions of temperature, salinity, dissolved oxygen, and density at 12 different levels. For example, on one chart, a narrow tongue of relatively high salinity water at middepth just south of the Aleutians can be clearly identified--although it is less than 100 miles wide and only slightly more saline than water on the other side of the Aleutian ridge, just 60 miles north.

The Pacific-wide perspective of the atlas makes it possible to trace that high salinity tongue on the same chart over 16,000 miles; eastward to Alaska, southward along the American coast to the Equator, west along the Equator to the Solomon Islands, then south to Tasmania. There, the water originates in a pool of high-salinity surface water that forms just south of Australia.

Computers Shorten Lifetime Work

Data for the atlas were purchased in punched-card form from the U. S. Navy Hydrographic Office and the National Oceanographic Data Center from 1959 to 1964. The data were processed by 3 different computer systems over more than 3 years. The several hundred hours of machine time were equivalent to about 50 man-years of manual data processing. Two to 6 technicians worked a total of about 18 man-months to plot the averaged data on charts. Following this, the author performed all subsequent steps on each chart and graph.

In all, the work that went into producing the atlas took 5 man-years of effort. It would have taken 50-60 man-years if automatic data processing had not been available.

△△△△△△△△

Foreign Fishing Off U. S. Coasts, April 1967

IN NORTHWEST ATLANTIC

Soviet: Her fishing and support vessels in the Northwest Atlantic off the U. S. coast nearly doubled during April. Weekly sightings revealed that the fleet increased rapidly, from 75 vessels early in the month to about 140 by month's end. This compares to about 60 vessels sighted during March 1967 and 125 vessels reported during April 1966. The Soviets are increasing their fishing and support vessels faster than in 1966, when the peak (over 150) was reached only by the end of June.

During April, 159 vessels were sighted and identified as 36 large factory stern trawlers, 20 large refrigerated side trawlers ("Pioner" class), 31 medium refrigerated or freezing side trawlers (25 SRTR's, 6 SRTM's), 58 medium side trawlers (SR's), 5 factory base ships ("Pionersk"), 7 refrigerated fish transports and cargo vessels, 1 tanker, and rescue tug.

The Soviet fishing fleet was divided into large groups dispersed from 75 miles south of Long Island, New York (Hudson and Block Canyons), to 100 miles east of Nantucket Lightship (Lydonia Canyon) off Massachusetts. Fishing extended for 220 miles along the 50- and 100-fathom curves of the Continental Shelf.

Beginning early in the month, the main fleet (75 vessels) was concentrated between Block Canyon and south of Nantucket Lightship. Principal fish caught in moderate quantities appeared to be whiting, red hake, and some herring. By mid-month, that fleet gradually shifted eastward to include the southeast slopes of Georges Bank. Fish seen on deck were whiting, red hake, and herring. Captains of U. S. fishing vessels reported 10 or more Soviet stern factory trawlers catching large quantities of haddock.

By month's end, the Soviets divided the vessels into 2 fleets: one of about 70 vessels, mostly side trawlers and support vessels, was found in a 30-mile area south of Block Island, Rhode Island. Moderate to heavy catches consisted primarily of whiting and red hake.

About 140 miles to the east, the other fleet (also about 70 vessels--stern trawlers, side trawlers, and fish transports) was located in a 20-mile area from Lydonia Canyon extending northward across the southwest part of Georges Bank. The stern trawlers were fishing in deeper waters taking mostly whiting, with some haddock. The side trawlers were working in more shallow depths (35-45 fathoms) and there was some evidence they were taking considerable amounts of haddock and other groundfish, along with whiting and herring. Huge piles of fish were observed in deck storage areas aboard processing vessels in both fleets.

OFF MID-ATLANTIC COASTS

Soviet: No vessels were reported off mid-Atlantic Bight. The small fleet off the Virginia Capes late in March moved north to Georges Bank. An estimated 50 Soviet vessels fished along the mid-Atlantic coast during April 1966.

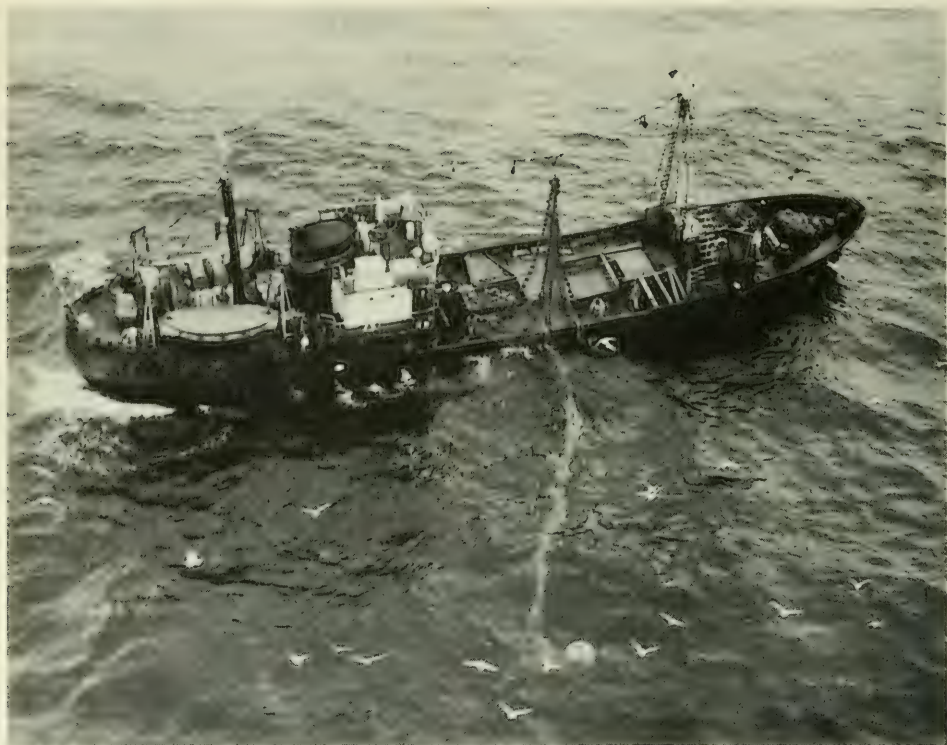
Cuban: On April 25, one Cuban freezer stern trawler (the "Manjuari") was sighted on Georges Bank. The vessel was underway heading probably for cod grounds (Grand Banks off Canada), where Cuban trawlers fished during 1966.

IN THE GULF OF MEXICO

No foreign fishing vessels were sighted off or near the U. S. Gulf Coast. Elsewhere in the Gulf, Cuban fishing activity was widespread, ranging from Puerto Rico and the Dominican Republic to Campeche Banks off Mexico; the Soviets, however, had only a few vessels in the area, most in transit to the Southwest Atlantic fishing grounds, or being serviced in the new Havana Fishing Port. The Soviet fishery research vessel "Obdorsk" (medium side trawler K-9029) of the Atlantic Institute for Fisheries and Oceanography was conducting fishery studies in the Old Bahama Channel (between Cuba and the Bahamas).

OFF CALIFORNIA

Soviet: The number of vessels sighted off California during April was greater than ever before. It indicated that the USSR has begun to exploit the fishing resources in the area on a large scale. Fishery research and exploratory vessels have been conducting studies of fish populations and concentrations for several



The Soviet medium trawler "Kosmonaut Feoktistov," photographed by the California Department of Fish and Game on March 31, 1967, was about 22 miles west-southwest of Half Moon Bay, San Mateo County (south of San Francisco). It belongs to the Far Eastern Fisheries Administration and previously fished for Pacific ocean perch in the Gulf of Alaska.

years and have obviously located commercially valuable stocks.

Fishing and support vessels sighted fluctuated from about 6 to over 20; most fishing was north and south of San Francisco. Although the number of sighted vessels fluctuated, that of large stern trawlers kept increasing (from none at beginning of April to 11 at the end). This indicated a rapidly growing fishing effort (average catch of large stern trawler is 5-6 times larger than average Soviet medium trawlers).

Early in April, 5 medium trawlers accompanied by a support vessel fished about 22 miles west of Half Moon Bay (south of San Francisco). By mid-April, however, 20

Soviet fishing and support vessels were sighted in about the same location; they were identified as 15 medium side trawlers and 1 large stern trawler, accompanied by 4 (unidentified) support vessels. The vessels were heavily concentrated in a 5-mile radius and, reportedly, were taking good catches of rockfish and Pacific hake at depths of 200-300 meters (650-1,000 feet).

Another large stern trawler, the "Skryplev," which explored off Mexico in March 1967, was sighted 38 miles off San Clemente Island on Tanner Bank (southwest of Los Angeles); she was obviously engaged in exploratory fishing, presumably for Pacific mackerel.

By April 22, a fleet of 2 medium side trawlers and 7 large stern trawlers fished for rockfish outside the 12-mile contiguous fishing zone between Bodega Bay and Gualala River in Mendocino County (north of San Francisco). By month's end, this fleet increased somewhat and divided; 6 large stern trawlers were again fishing off Half Moon Bay, while 7 fishing and support vessels were sighted about 20 miles off the mouth of Russian River, not far from Bodega Bay.

Most observed Soviet catches during April were species of rockfish. The 20 vessels sighted off Half Moon Bay in mid-month were observed fishing for rockfishes and Pacific hake with small-mesh (2-3 inches) cod-ends and taking good catches. No reliable estimates of total Soviet catches off California can yet be made. At least one large stern trawler is known to have landed over 130,000 pounds of fish in a single day in the Bodega Bay area. This is a record catch and the crew worked extremely hard (setting and hauling the trawl 10 times during the day), but it also indicates that greater fishing effort off California was prompted most likely by good fishing.

OFF PACIFIC NORTHWEST

Soviet: In the first week of April, 6 Soviet vessels fished off the Oregon coast, taking primarily Pacific hake and true cod. As hake increased and flounder fishing in the eastern Bering Sea ended, more vessels were assigned to the area; by month's end, 97 Soviet fishing, support, and research vessels fished off the Oregon coast, mostly off Newport in the Heceta and Stonewall Banks regions.

The hake season developed slower. During the first 3 weeks of April, the fishing and support vessels off Oregon never exceeded 30. Although 6 more stern trawlers were sighted at month's end, the total number off the Pacific Northwest was about 40. In 1967, it has more than doubled.

Fishing pair trawls in addition to regular bottom trawls were used by some vessels. During surveillance flights, catches varying from water hauls to around 20,000 pounds of hake were observed. On the average, catches were moderate to good and consisted primarily of hake, with possibly a few rockfish mixed in.

The Soviets followed their normal pattern of having exploratory or research vessels work with the fleet to locate fish.

There was no Soviet fishing off the Washington coast, except for vessels on the way to Oregon.

OFF ALASKA

Japanese: Her vessels operating off Alaska increased from about 90 to 104 during April. There was Pacific ocean perch fishing in the Gulf of Alaska in 3 areas: Southeastern Alaska, Yakutat grounds, and Albatross Bank. The large side trawler "Tone Maru" fished during early April off Southeastern Alaska and then returned to Japan; the factory trawler "Kirkishima Maru" fished in mid-April and shifted to the Yakutat grounds before returning home. In late April, the factory trawler "Ryuyo Maru" and the smaller trawler "Kitigami Maru" fished perch off Sitka Sound in Southeastern Alaska. The small stern trawler "Hoyo Maru" fished on the Yakutat grounds all month. In mid-April, she was joined by the factory trawlers "Kokuyyo Maru" and Kirishima Maru, which returned to Japan in late April.

The factory trawlers "Daishin Maru No. 12" and "Yutaka Maru" fished for perch on Albatross Bank through April. In late April the factory trawler "Taiyo Maru No. 82" and the smaller trawler "Akitsu Maru" joined the perch fishery on Albatross Bank.

The factory trawlers "Akebono Maru No. 72" and "Aso Maru" fished for perch along the edge of the Continental Shelf south of the Pribilof Islands until midmonth, then returned to Japan.

The Alaska pollock fishery continued north of Fox Islands in the eastern Aleutians at the March tempo. At April's end, the factory ships "Shikishima Maru," "Gyokuei Maru," "Soyo Maru," and "Nisshin Maru No. 2" were active in the pollock fishery. They are accompanied by 60-62 trawlers. Independent trawlers included the factory trawlers "Akebono Maru No. 52," "Zuiyo Maru No. 2," and the smaller trawler "Inase Maru No. 5." The factoryship "Chichibu Maru," licensed to be accompanied by 12 trawlers, ended fishing north of Fox Islands in late April, about the time the Nisshin Maru No. 2 fleet arrived. It is believed the Chichibu Maru fleet has shifted its area of operations.

The king crab factoryships "Keiko Maru" and "Tainichi Maru" accompanied by 9-10 net-setting trawlers operated throughout April on the traditional grounds in outer Bristol Bay.

The long-line vessel "Fukuyoshi Maru No. 15" operated in the western Gulf of Alaska, south of Chirikof Island, during mid-April. At month's end, 2 more long-liners, the "Ryusho Maru No. 2" and "Tenyo Maru No. 10," were off Southeastern Alaska between Cape Ommaney and Sitka Sound. They were taking sablefish. One long-line vessel was fishing just north of the central Aleutians during mid-April.

Soviet: The number of vessels decreased from about 150 in early April to about 40 by month's end. The Gulf of Alaska perch fishery remained relatively stable until late April, when all but nine vessels left, mostly for the Pacific Northwest. In Southeastern Alaska, the perch fleet dwindled from 9 trawlers and 2 reefers in early April to about 3 trawlers and 1 reefer by month's end. During the first week of April, 26 trawlers and 4 support ships were concentrated on the Yakutat grounds; by mid-April, most shifted to Portlock Bank. The Yakutat grounds were completely abandoned by the end of April.

In mid-April, the Portlock Bank area west of Middleton Island supported 23 trawlers, 5 reefers, and 1 tug. By the end of the third and fourth weeks, there were only 4 trawlers and 1 reefer remaining on Portlock Bank.

Perch fishing on Albatross Bank went on for only a week in mid-April when 3 medium freezer trawlers were reported fishing east of Trinity Islands.

The perch fishery south of Fox Islands in the eastern Aleutian Islands remained relatively stable with about 23 trawlers and 3 reefers until late April, when the fleet decreased to 5 trawlers and 1 support ship. The shrimp fishery continued off Afognak Island, with 15 medium freezer trawlers, 1 cannery, and an occasional support ship until mid-April. During last two weeks, 9 or 10

freezer trawlers and 1 factoryship remained. The 5 trawlers fishing for shrimp in Shumagin Islands finished in early April.

The Soviet flounder fishery continued to decrease from first week, when 35 trawlers and 10 reefers were in it; by midmonth, fishing was abandoned completely.

Three canneries accompanied by 9 tangle-net-setting medium trawlers and 33 net pickers fished and processed king crab in the eastern Bering Sea.

VIOLETIONS OF U. S. TERRITORIAL WATERS

Violations of U. S. territorial waters by foreign fishing vessels have been increasing in recent years. The 40 violations reported in 1964 increased to 67 in 1966, and led to the recent stiffening of U. S. enforcement measures. Of 145 reported territorial violations, 1964 through March 1967, almost 70 percent (103 vessels) were by Soviet-flag fishing vessels. The Soviet vessels also were the chief offenders in violating the 9-mile contiguous fishery zone.

Year	USSR	Cuba	Japan	Canada	Total
	(No. of Vessels)				
1967 ¹ ..	11	-	3	-	14
1966 ..	44	-	4	2	50
1965 ..	31	-	10	-	41
1964 ..	17	4	19	-	40
Total ..	103	4	36	2	145

Year	USSR	Cuba	Japan	Canada	Total
	(No. of Vessels)				
1967 ¹ ..	11	-	3	-	14
1966 ² ..	16	-	1	-	17
Total ..	27	-	4	-	31

¹/Data up to March 30, 1967.
²/Data since October 15, 1966.
 Source: U. S. Coast Guard, Branch of Marine Law Enforcement.

Not all reported violations were substantiated fully by photographic or other evidence and so the U. S. Government took legal action in only 3 recent cases.



STATES

Alaska

HERRING-ROE-ON-KELP HARVEST IS HELD

The annual herring-roe-on-kelp fishery in Alaska was held at Craig and at Sitka in April, reports BCF Juneau. At Craig, the "season" was open for 20 minutes--and 1,230 pickers harvested 203,000 pounds. At Sitka, the "season" was open for 45 minutes--and 850 pickers harvested 158,000 pounds. Pickers were paid \$1-\$1.25 per pound. The first wholesale value of the product is estimated at \$2 per pound. These prices mean that pickers averaged about \$350 per hour for their effort.

The high market value of herring-roe-on-kelp, its ease of collection, and simple processing requirements have led to significant enforcement problems. The temptation to pick "dollars" off the beach has been great. At least 3 buyers and a larger number of pickers have been caught dealing in illegally taken spawn.

The herring-roe-on-kelp fishery occurs at the time of year when other fishing income is at its lowest. Its participants are largely Alaskans. This means that a significantly larger percentage of the income from the fishery is spent in the villages and small towns of Southeastern Alaska than for any other fishery. The product is exported almost wholly to Japan. These aspects of the fishery make its continuation important--if it can be demonstrated that the harvest does not reduce the herring stocks significantly.



California

40-45 TONS OF SNIPEFISHES ESCAPE NETS

The April report of the Resources Agency of California contains this item:

During early morning on April 27, two San Pedro purse seiners set their nets on what their skippers believed were schools of mackerel. One had observed with his fathometer an estimated 30-ton school 8 to 10

fathoms beneath the surface in 35 fathoms of water at Pyramid Cove, San Clemente Island. Simultaneously, about a half mile away, the other seiner was surrounding a 10- to 15-ton school that had been noted between 6 fathoms and the bottom in 35 fathoms of water. Most of the "mackerel" they thought they were capturing were small enough to go through the mesh of their anchovy nets. Each seiner ended up with about 100 pounds of gilled slender snipefish (Macroschamphosus gracilis).

Prior to these captures, slender snipefish were very rare in the eastern Pacific. Fewer than 100 individuals have been caught between Santa Monica Bay and Magdalena Bay. In other world seas (the species was described from the mid-Atlantic), about 100 more individuals have been taken.

The snipefish that were gilled averaged 12 to the ounce (192 per pound). The two San Clemente Island schools would have yielded over 15,000,000 snipefishes to the purse seiners. There is still a ray of hope, although a circuitous one: snipefishes are fed upon by albacore, yellowtail, and rockfish--so the escapes may yet be of some value to local fishermen.



Massachusetts

BOSTON IS BUILDING A PROPER AQUARIUM

The Central Wharf of the storied old seaport called Boston is being reborn. The wharf once was an important stop for coastal ships but, more recently, it became just another part of the rundown waterfront. Rising now on the end of the rebuilt Central Wharf is an aquarium, which is bound to make a big splash in a city that has been without one since 1954.

Bostonians are watching the progress in shaping the concrete shell of a 6-story-high structure that will boast a cylindrical 4-story-high tank. The giant fish tank, heart of the structure, will hold 200,000 gallons of water. A spiral ramp will circle it. A reef environment will be created as home to 40 aquatic species--including groupers, loggerhead turtles, moray eels, leopard sharks, and spotted eagle rays.

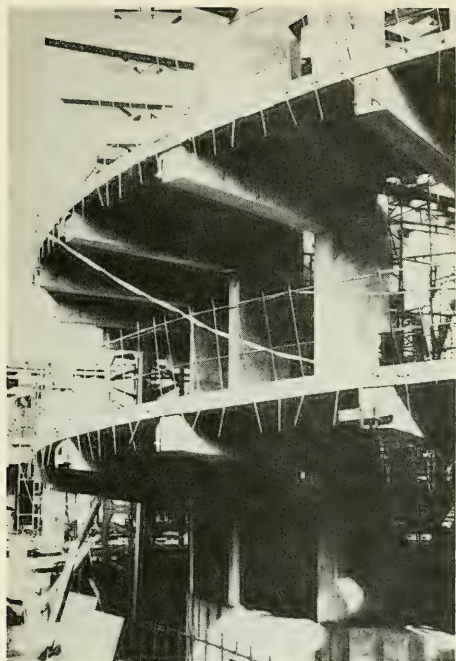


Fig. 1 - Work in progress on interior of the structure.

A View from the Top

Standing at the top of the ramp, the visitor will be able to look into the tank, then walk around its 125-foot circumference to the bottom. While walking, he will be able to look through the $3\frac{1}{2}$ -thick glass.

The aquarium also will have 40 smaller tanks of different sizes in 4 gallery areas. And for the children, there will be a special aquarium and dioramas showing other aspects of life in the pond and in the sea.

If the aquarium receives enough contributions, there will be other exhibits. One will contain live penguins in an Antarctic environment. Another will be a tidal pool that will ebb and flow twice in a 24-hour period. It will have starfish, hermit crabs, and other New England coast marine species.

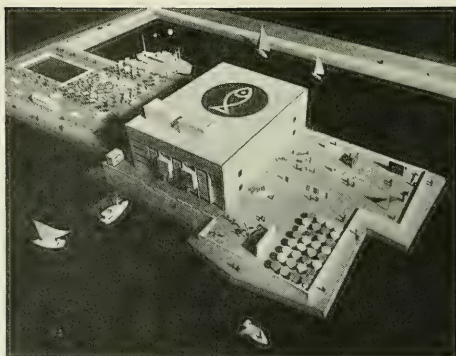


Fig. 2 - Model of the aquarium being built in downtown Boston. The fish on the roof has not been identified.

(Photo: S. F. Rosenthal)

The cost of rebuilding Central Wharf and building the aquarium is expected to be \$14.3 million.



Virginia

EDA AIDS OYSTER CULTURE STUDY IN LOWER CHESAPEAKE BAY

A study to determine whether it is practicable to set up commercial oyster hatcheries in the lower Chesapeake Bay area will continue with support from the U. S. Commerce Department's Economic Development Administration (EDA). The sum of \$33,150 was approved for the Windmill Point Oyster Co., Irvington, Va., a producers' cooperative that expects to use the study findings to increase production and sale of seed oysters.

The company itself is investing \$11,050--making a total project cost of \$44,200 for the coming season. BCF initiated the project and invested over \$16,000. In mid-1966, EDA began funding it.

Some significant data already have been developed on the spawning of oysters and the setting of larvae. BCF will continue to monitor the study and give technical aid.



Washington

EDA APPROVES MORE FUNDS FOR PACIFIC HAKE PROJECT

The Commerce Department's Economic Development Administration (EDA) has approved a request from the Grays Harbor Regional Planning Commission for \$110,000 more to operate 10 charter vessels for 80 days in studying the feasibility of starting a commercial hake fishery. EDA approved the project in September 1966 and already has provided \$126,000.

Last season, the 4 vessels were practically crowded off the grounds by the huge Soviet fleet that blanketed the areas of high hake concentrations from mid-May to December 1966. As a result, the study objectives were not fully realized. However, conditions are more favorable this season because of the new 12-mile fisheries zones and the signed U.S.-Soviet agreement to keep the Soviet fleet seaward of 60 fathoms between Grays Harbor and the south side of the Columbia River.

BCF personnel met with EDA officials on April 18 to discuss the new request for more money and supplied information to justify it.

* * *

PUGET SOUND HAKE CATCH ROSE IN 1966

The catch of Pacific hake in Puget Sound's inside waters, primarily from Port Susan and Saratoga Passage, reached 9 million pounds for the winter-spring 1966/67 season. The catch for the 1965/66 season was 6½ million pounds. Five vessels participated in the 1966/67 season of the new fishery, which resulted from BCF exploratory fishing and gear development.

The most active vessels again were the 78-foot "St. Michael" and the 59-foot "St. Janet". They achieved average catch rates of 10,400 lbs./hour and 8,800 lbs./hour of fishing time, respectively, for the entire season.

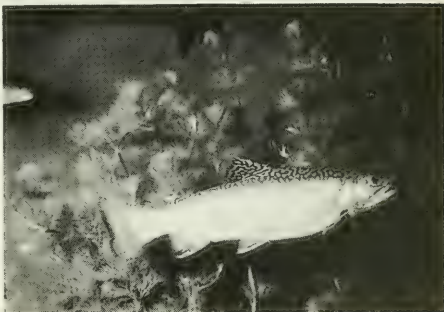


BROOK TROUT IS MICHIGAN'S STATE FISH

When Michigan selected the "trout" as the state fish, it left open the question which of four kinds of trout found in Michigan would serve as a model for illustrations. Michigan's Governor Romney referred the matter to his Conservation Department.

Possibilities included brook, brown, rainbow, and lake trout, all common to Michigan. Of those, only the brook and lake trout are native to the State. Brown trout was imported from Germany and rainbow trout from the West Coast. Department personnel felt the chosen species should be a native and thus narrowed the field to two.

The final decision in favor of brook trout rested on these facts: Brook trout (Salvelinus fontinalis) are more widely distributed in Michigan waters than lake trout, are more colorful for illustration purposes, are caught by more fishermen, and are therefore perhaps more truly representative of the State. (Michigan's Department of Conservation)



Brook trout in aquarium.

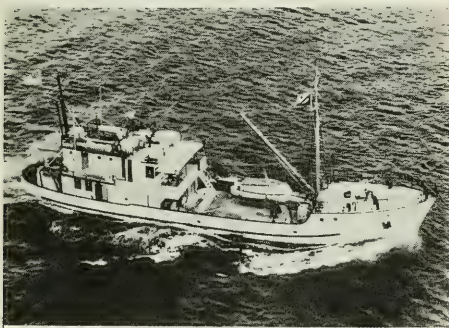


Marlin coming aboard a research vessel of the BCF's Biological Laboratory in Hawaii.

BUREAU OF COMMERCIAL FISHERIES PROGRAMS

"Gilbert" Completes 100th Cruise

BCF's Charles H. Gilbert completed her 100th scientific research cruise in the waters of the central Pacific on April 28. The 120-foot vessel, completed in 1952, was designed specially for research in the central Pacific. She carried out her first research mission on the voyage from San Diego to her home port of Honolulu in June 1952. In 100 voyages, she has sailed 325,000 nautical miles, about 13 trips around the globe. Manned by expert fishermen and skippered by Capt. Joe Yoshioaka, the Gilbert spends an average of over 200 days a year at sea.



BCF's research vessel Charles H. Gilbert.

In 16 years, Gilbert has made 8 cruises to the Marquesas and Tahiti, 2 to the Mexican coast, 2 to San Francisco, 2 to New Caledonia, 6 to the Line Islands, and 3 to the Leeward Islands. "A whole generation of oceanographers and fishery biologists have received their training in practical research at sea aboard the Charles H. Gilbert," says Richard S. Shomura, Acting Area Director, BCF, Hawaii. He himself served as a technician aboard the ship when he started his career as a scientist. "She has made some real contributions to science. For example, just about everything we know about the behavior of tunas in the sea comes from observations made aboard her."

During Cruise 100, the Gilbert conducted her usual task of catching live tunas to be held at the Laboratory's Kewalo Basin facility for experimental studies in behavior and physiology of fishes; 55 wavyback skipjack and 1 yellowfin tuna were returned live.

2 Ride A Sea Sled

Two days were devoted to sea-sled studies. The sea sled is a Stokes basket litter. Scientists at the BCF Exploratory Fishing and Gear Research Base, Seattle, Wash., have fitted it with a tubular frame, windshield, diving planes, and other equipment. It has no power but is towed by the ship. It communicates with the ship by a buzzer system. Two divers ride the sea sled, wearing wet suits, life jackets, and SCUBA equipment. One serves as pilot, the other as photographer. Tested off Waikiki and Waianae recently, the sea sled was towed safely at the surface at 9 knots, and underwater at 2 knots. It went to a depth of 45 feet in the tests. When submerged, the sled was towed as close as 25 feet to the Gilbert's stern in the feasibility tests--and as far away as 150 feet.

Object of the sea-sled studies is to observe and photograph the interaction of baitfish and the tunas, says Robert T. B. Iversen, a scientist at the Honolulu laboratory interested in baitfish studies. In tests off Waianae, the 2-inch-long baitfish nehu were seen swimming as deep as 30 to 40 feet; movies were made of their behavior.

In the Hawaiian aku fishery, the tunas are attracted to the ship by throwing live bait into the water. How the baitfish behave after they hit the water is unknown. By studying their behavior, Laboratory scientists hope to gain clues as to what makes one species of small fish good bait, another poor. The Hawaiian fishery is heavily dependent on the nehu, a slender, short-lived, anchovy seined mostly in Pearl Harbor and Kaneohe Bay. Catching bait takes the aku fleet much time.

During Cruise 100, movies and visual behavioral data were obtained from the sea sled of 2 species of baitfish, nehu and mosquitofish, after they were chummed into the water. There were no predators present.

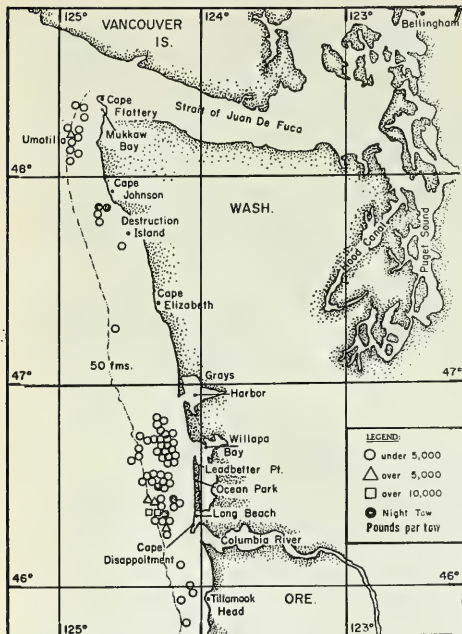


The "Baron" Finds Anchovy in Many Areas

The BCF-chartered Baron returned to Seattle on April 8 after 127 days of experimental midwater trawling for anchovy along

the Coast of Washington from Cape Flattery to Yaquina Bay, Oregon (Cruise No. 8). Anchovy catches averaged 1,800 pounds per hour of trawling; the largest catch was 12,000 pounds in a single haul.

The primary objective was to test experimental midwater trawl gear and related instrumentation for possible use in capturing anchovy in commercial quantity.



M/V Baron gear research Cruise No. 8.

The experimental anchovy trawls were similar to the "Cobb" pelagic trawl, except $\frac{1}{2}$ -inch mesh was used throughout. The standard 18 Cobb pelagic trawl was 600 meshes across of 3-inch webbing and was equipped with a $\frac{1}{2}$ -inch mesh intermediate and full cod-end liner; the $\frac{3}{4}$ -scale C.P.T. had the same number of meshes but was constructed with 2-inch webbing, resulting in a $\frac{1}{3}$ reduction in size with a full codend liner of $\frac{1}{2}$ -inch mesh webbing.

Vessel and Equipment: The Baron is a 96-foot seiner-dragger type vessel powered by a 510 hp engine. It operates with a 4-man

crew. Pilot house equipment includes radio telephone, loran, radar, depth sounder and sonar. Deck machinery includes hydraulically operated separate drum trawling winches, trawl net reel, and dual hoists. The hold capacity is about 100 tons.

Method of Operation: Onshore-offshore sounding and sonar transects were made between the 20- and 125-fathom depth contours between Cape Flattery and Umatilla, Wash., and from 18 to 65 fathoms south of Umatilla to Yaquina Bay, Oreg. When anchovy schools were located, they were fished to ascertain catch rates with the various nets and catch composition. The geographical size of several anchovy schools was determined by spacing the tows and by sounding transects in the areas of the school. Repetitive tows were made on anchovy schools to determine the cruise objectives.

RESULTS

Seventy-one drags were made during the cruise--28 with the experimental anchovy trawl No. 1; 22 with the standard 18 Cobb pelagic trawl; 14 with the $\frac{3}{4}$ -scale C.P.T.; and 7 with the experimental anchovy trawl No. 2. Anchovy was the dominant species taken, followed in order by smelt, rockfish, soles, flounders, dogfish sharks, ling cod, true cod, and only 1 soupfin shark.

Availability of Anchovy: They were found in most areas between Cape Flattery, Wash., and Tillamook Rock, Oregon. Juvenile anchovy were found in the North Washington Coast area and adult anchovy were generally found in the southern coastal waters.

Catch Rates: The table gives the amount of anchovy caught by each net used, number of drags made with each, total fishing time, and hourly catch rate. The miscellaneous species were mostly juvenile smelt.

Gear Performance:

Trawls--The light-weight, fine-mesh anchovy trawls required frequent repair caused mostly from dragging the nets on bottom. Anchovy trawl No. 1 was once extensively torn from capturing a large quantity of jellyfish. Other experimental Cobb pelagic trawls performed normally without significant damage from use on the bottom. The Standard 18 Cobb pelagic trawl equipped with an intermediate and full-length codend liner was

Offshore Hourly Catch Rate for Cruise No. 8.

Net	No. of Drags	Time Duration Hrs.	Anchovy Catch Lbs.	Anchovy Catch Per Hr. Lbs.	Total Catch	Catch Per Hr. (all species) Lbs.
Anchovy No. 1	28	20	36,286	1,814	47,488	2,374
Anchovy No. 2	7	7 $\frac{1}{3}$	7,090	955	11,225	1,530
600-mesh C.P.T.	22	19 $\frac{1}{6}$	33,285	1,722	40,836	2,130
$\frac{2}{3}$ -scale C.P.T.	14	11 $\frac{5}{6}$	30,310	2,562	60,260	5,091

difficult to control in strong tides. The $\frac{2}{3}$ -scale Cobb pelagic trawl could be controlled more easily and towed at faster speed than the other trawls.

Load cell indicator--To determine the amount of fish being captured by the trawl, a load cell was mounted on a ribline ahead of the codend. A combination of electrical-mechanical towing cables and electrical ribline was used. The data were displayed on a strip chart recorder mounted in the pilot house. Although some failures occurred with mechanical connectors, the system performed satisfactorily for several tows. Preliminary analysis of the data indicates that load increases as fish are captured.

Observations of Fish Behavior: During daylight hours, anchovy were found on or near the bottom. Anchovy rose toward the surface and were taken from 5 to 16 fathoms below the surface during hours of darkness.

CONCLUSIONS

1. Large schools of juvenile anchovy were found off the coast of Washington.

2. Catch rates of juvenile anchovy were low due to excessive escapement through $\frac{3}{4}$ -inch mesh of anchovy trawls and $\frac{1}{2}$ -inch mesh liners of Cobb pelagic trawls.

3. A winter fishery for anchovy off the coast of Washington would not be feasible with state-of-the-art midwater trawls and present industrial fish prices.



"Oregon's" Shrimp and Swordfish Catches Are Light

The R/V Oregon returned to St. Simons Island, Ga., on April 28 after a 12-day exploratory fishing cruise off Florida and the northern Bahama Islands (Cruise 117). Primary objectives were to continue seasonal nighttime longline coverage for swordfish at pre-selected standard fishing stations, and to continue assessment of offshore stocks of grooved shrimp off Florida's east coast.

Swordfish catches were light--a few small fish were taken. Only scattered brown shrimp were found in Cape Kennedy survey area.

Swordfish: Four 60-basket (600 hooks) longline sets were made between 27° N. and 30° N. Buoy drops on each set varied from 5 to 50 fathoms spaced at 10-basket intervals. Hooks were baited with thread herring (*Opisthonema oglinum*) and mullet (*Mugil* sp.) on alternate baskets.

The longline gear was set at these locations: one set in the axis of the Gulf Stream off Stuart, Florida (390/430 fms.); two sets on the Blake Plateau (Antilles Current) in 650/575 and 465/455 fms.; and one set beyond the 1,000-fm. isobath (2400/2700 fms.).

Only two swordfish were taken: one male (32 lbs.) was taken in the axis of the Gulf Stream on a 30-fm. drop baited with mullet; the second male (38 lbs.) was taken on the Blake Plateau (650/675 fms.) on a 50-fm. drop baited with mullet.

Shrimp: This is the second cruise of a series to determine annual bottom temperatures and brown and pink shrimp (*Penaeus aztecus* and *P. duorarum*) catch-rate relationships between 20 and 40 fms. off New Smyrna Beach, Cape Kennedy, and Melbourne, Florida.

Thirty night-time drags were occupied with a 40-ft. flat trawl on 6-ft. chain doors. Only small amounts of scattered brown and pink shrimp were caught in these offshore areas (20-38 fms.). Catches varied from 0-1½ lbs. of 21/25 count heads-on brown shrimp (*Penaeus aztecus*) and 0-2 lbs. of 21/25 heads-on count pink shrimp (*Penaeus duorarum*) per 1-hour drag.

Rock shrimp (*Sicyonia brevirostris*) were caught in small quantities (less than 1-12 lbs. of 26/30 heads-on count) at all stations in the sampling areas.



"Kaho" Makes Large Trawl Catches of Alewives in L. Michigan

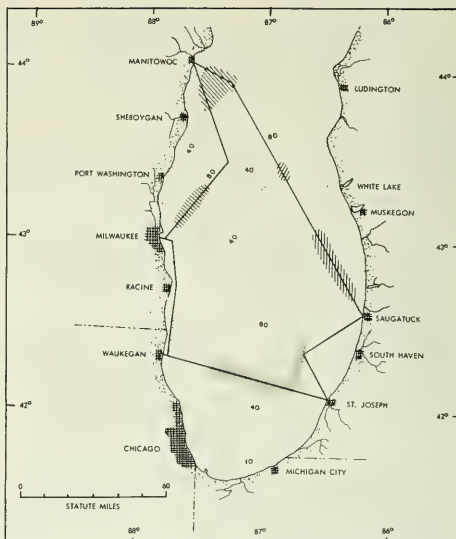
BCF's research vessel Kaho made some good catches of alewives during a 9-day echo-sounding and trawl fishing survey cruise in southern Lake Michigan (Cruise 38, ended April 11).

The cruise's primary purpose was to collect data on the bathymetric distribution of alewives just prior to their annual inshore spawning run--and to collect more information on the timing and strength of the run. A secondary objective was to collect alewives for biological studies.

In previous years, bottom concentrations of alewives have been difficult to locate early in April. This indicated a possibility that schools may break up and leave the bottom. Observations during Cruise 38 support this theory. Heavy bottom concentrations were located only in the southern portion of the lake below 40 fathoms (chart). Elsewhere in the study area, fish were observed to be scattered or in loose schools at midwater. An excessive amount of stormy weather during April may have been responsible for scattering the schools.

Trawling was limited during the cruise. Only 3 exploratory drags were made to confirm the presence or absence of alewives in certain depths or areas:

Location	Date	Depth Fathoms	Minutes Fished	Actual Catch in Pounds			
				Alewife	Chubs	Sculpins	Total
Benton Harbor	April 5	43	20	160	2	-	162
Waukegan	April 5	50	30	750	50	-	800
Port Washington	April 8	60	10	60	50	5	115



Track lines of echo-sounding survey by the R/V Kaho during Exploratory Cruise 38. Shaded area indicates densest bottom concentration of alewives. Hatched areas indicate schools of fish observed at mid-water depths.

The experience of commercial trawlers before, during and after the Kaho cruise helped to compose a fairly clear picture of this year's alewife migration from deep offshore waters to shallow inshore waters in the southern reaches of Lake Michigan. An unusually continuous series of severe storms permitted only intermittent trawling, which served to dramatize the rapid inshore migration. During the last week in March, trawlers made good catches at 54 to 60 fathoms off Saugatuck. Heavy concentrations were found at 40 to 50 fathoms off Benton Harbor the first week in April. On April 12, good catches were made at 6 fathoms off Benton Harbor. On April 15, large trawl catches were taken inside an ore carrier slip in Gary, Indiana.

The change of temperature associated with northerly winds in storms during the third week of April disrupted the alewife migration in the southern end of the lake. For nearly a

week, no alewife concentrations could be found in or near Gary Harbor. Alewife schools appeared again in the area about April 25.

Commercial trawlers on the west shore of Lake Michigan have had fair-to-good alewife fishing from the first week in April off Milwaukee, and from the third week off Two Rivers.



Pause In A Vessel Loan Program

All funds currently available for payment of fishing vessel construction differential subsidies have now been obligated, and a number of applications have been approved subject to the availability of funds. As a result, BCF is compelled to refuse acceptance and consideration of any more applications for construction differential subsidies until July 1, 1967.



Gloucester Puts Together Trawl Instrument Package

A "packaged unit" trawl instrumentation system has been assembled by BCF's Gloucester Exploratory Fishing and Gear Research Base and is ready for use on commercial trawlers. It is based on the sonic-transducer system that was developed to measure experimental trawls. The new unit records on a 7-inch-wide strip chart the vertical and horizontal opening and bottom contact of the trawl while it operates on the ocean bottom.

The unit will be used for the first time aboard the 83-foot Gloucester trawler "Annette G." on its next trip.



Takes Part in Sanitation Workshops

During the first half of May, BCF participated with the Food and Drug Administration (FDA) in 3 FDA/BCF workshops on the sanitary processing of breaded shrimp and smoked fish--in Los Angeles, Calif.; Brownsville, Tex.; and New York City. The recent

increase in the inspection of seafood products for bacteria has heightened industry interest in the sanitation aspects of fishery products.

These 3 workshops demonstrated an effective technique to help the industry improve its sanitation. BCF will continue to take a major role in future meetings. FDA is considering a workshop for the Atlanta, Ga., area.



La Jolla Develops New Fast-Sinking Purse Seine

A working model of a new, fast-sinking, tuna purse seine has been developed and tested successfully by scientists of the BCF Tuna Resources Laboratory, La Jolla, Calif. The net sinks almost 3 times faster than conventional purse seines. This important feature increases the speed of net setting and reduces the chance of escape of an entrapped school of tuna.

The net experiments were carried out by Roger E. Green, BCF, and M'nakhem Ben-Yami, a gear technologist from Israel. They used testing facilities of the U. S. Navy and the San Diego Department of Utilities.



Monhegan's Lobsters Stay Close to Home

The lobster population tagged by BCF's Boothbay Harbor Biological Laboratory at Maine's Monhegan Island in November 1965 and July 1966 has not strayed from the island area. Of 1,116 lobsters released in November 1965, 905 (81 percent) have been recovered at least once. Of 600 released in July 1966, 40 (7 percent) have been recovered during 9 weeks of fishing at Monhegan. None of the 1966 releases has been recovered outside the Monhegan area.

Long-term tag retention rates remain at about 45 percent for lobsters retaining at least one elbow tag, 90 percent for back tags, and 48 percent for brands. Tag retention rates for individuals having shed are similar. About 55 percent of the January, February, and March returns had shed the previous

year. All recoveries retained the amputated scute and spine marks, thus distinguishing their tag type and time of release.



Export Promotion Program Gains Overseas Markets

Fishing industry members report that the work of BCF's Office of International Trade Promotion has enabled them to establish overseas markets for fishery products processed from underutilized species. Fish franks made from carp have been sold in Germany. Fish pepperoni, manufactured from shad and rockfish, created much interest in Frankfurt and, when produced commercially, will have a market in Western Europe.

Calico scallops, with roe, were promoted in France, England, and Germany and resulted in an initial sale of 30,000 pounds for export.

BCF looks forward to introducing more new processed products this fall, including a breakfast sausage made from shad and other underutilized species.



Take Fish on Your Picnic--Or Into Your Backyard

On those warm days when the family chef moves outdoors--into the backyard or to a picnic area--she and her family will be rewarded if she cooks fish. There are endless delicious possibilities, suggests a new BCF promotion program, that will reach its peak in the summer. Industry is being encouraged to participate fully.

The program is designed to make the public more aware of fish--and to reduce industry's heavy inventories. (However, BCF will continue to be friendly to the Tom Sawyers who cook non-store-bought fish.)

BCF information leaflets and photographs are being readied for distribution to the food editors of major newspapers throughout the U. S. Also, special promotion pieces are being prepared for retail outlets encouraging

their advertising and merchandising support. Some industry members already have agreed to emphasize "Outdoor Fish Cookery" during this period.



La Jolla Issues 1967 Temperate Tuna Forecast

BCF's Tuna Resources Laboratory at La Jolla, Calif., has issued its seventh consecutive annual prediction for the seasonal summer albacore and bluefin tuna fisheries off the Pacific Coast.

For albacore tuna, the Tuna Forecasting Program staff's "best guess" region is based solely this year on its knowledge of the April-July changes in thermal conditions off Southern California-Baja California (Figure 1). Coastal upwelling appears to have intensified in the region from Point Conception to Punta Banda in April; if these conditions prevail through May and into June, sea temperatures offshore should be as much as 2° F. colder than July 1966.

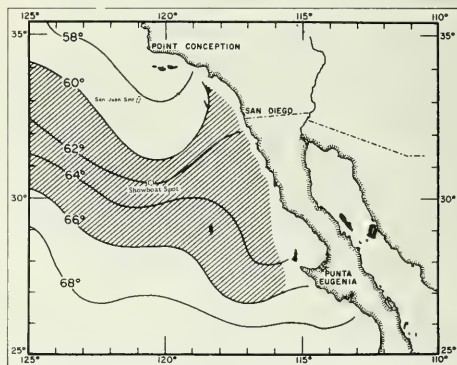


Fig. 1 - Forecast sea surface temperature field for July 1-15, 1967. Waters within the shaded zone are expected to yield most of the albacore tuna to be taken during this period.

The open ocean in the region encompassing the general migratory route of albacore (east of longitude 140° W.) appears to be warming slightly less than average. This indicates that the shoreward migrants probably will be later than last season and appear in the first or second week of July. Waters off Cape Mendocino and Cape Blanco are warming less

rapidly than last year. If this trend continues unabated, it suggests that the Oregon fishery probably will commence in the third or fourth week of July, about 3 weeks later than 1966.

July landings in Southern California probably will be below the 1945-66 average of 7,582,366 pounds (3,791 tons). Total season landings from Southern California-Baja California should improve substantially from 1966 (the poorest since 1947), reflecting a southward trend in distribution of fish this year. Oregon production probably will fall off from last year's record, reflecting a return to cooler, more normal oceanographic conditions. Fragmentary data on year-class representation suggests that fish abundance may be average for all size groups entering the fishery; thus, total U. S. West Coast landings are expected to be near the 1944-65 average of 42,000,000 pounds (21,000 tons).

Bluefin Tuna

In previous years, the staff restricted its forecasts for bluefin tuna solely to the Southern California offshore region. This year, however, it is attempting to provide the same kind of statements as for albacore.

The high-seas purse seine fleet already has begun to assemble in the Cape San Lucas-Cape San Lazaro, Baja California offshore region. At present, the boats are reported to be working in warm water on yellowfin and skipjack, but unconfirmed rumors report bluefin schools appearing in the 65°-67° F. water off Point Tosco (see Figure 2). For the past 4 years, oceanographic conditions in this region have created a zone of 65°-67° F. water extending from the northwest, approaching the coast between Cape San Lazaro and Cape San Lucas. This region is expected to produce bluefin again this season, and the first commercial action should be well underway by Memorial Day, winds and seas permitting. Coastal upwelling has been accelerated substantially during the last 4-6 weeks in this area, due largely to stronger northwesterly winds than a year earlier.

Bluefin tag return data indicate that the open ocean off Baja California from 50-300 miles out appears to embrace the northward migratory route as the summer season advances. Once the season commences off Cape San Lazaro-Point Tosco, the La Jolla staff expects again to see the bulk of the 1967 production originating from the region south of

the International Border. Bluefin are expected to appear in the Southern California offshore area by the third week of August; however, production from this area is expected to comprise a relatively small percentage of the total catch.

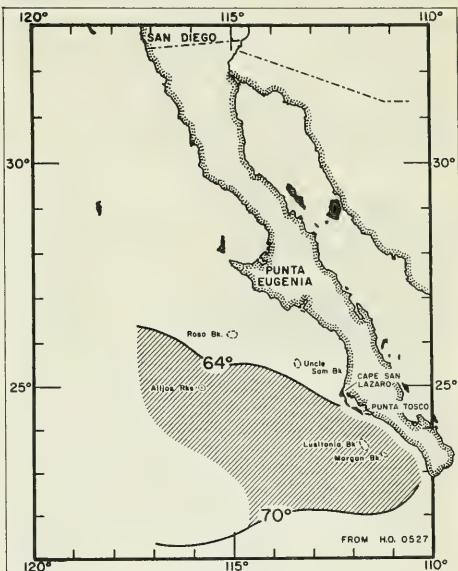


Fig. 2 - Shaded zone delimits the region expected to produce bluefin tuna during the June 1-15, 1967 interval.

Last year, an all-time high of 34,820,406 pounds (17,410 tons) of bluefin tuna were taken by the purse seine fleet. Although this production record may not be duplicated again this year, the staff has reason to expect production to be above the 1961-66 average of 26,060,312 pounds (13,030 tons). This estimate is based on the expected return of last season's strong incoming year-class (which produced a large percentage of the total tonnage landed), and also on a very high amount of fishing effort by a modern, efficient, purse seine fleet this year. Effort could increase further if the yellowfin tuna season is closed in midsummer.

As for climate, the U. S. West Coast should experience a return to more normal weather conditions this year. The mean sea level pressure pattern trends currently being observed suggest that pressure gradients will be intensified this summer, northwesterly

wind flow will be enhanced, and midsummer coastal upwelling will be more evident than last year, especially from Point Conception to Cape Mendocino. These conditions foretell increased turbulence, mixing, cold advection (horizontal shifting of air mass) and evaporative cooling of the upper mixed layer of the sea; also, the intensification and expansion of the length and breadth of the cold-water upwelling zone. Fishermen are advised to observe weather trends carefully, and to make full use of the sea temperature charts and advisory materials available from the Tuna Resources Laboratory via Radio Station WWD broadcasts.

Full-scale operation of the Naval Weather Service Environmental Data Network link with the master computer facility at Monterey should augment La Jolla's understanding of oceanographic and climatological events this year. The staff of the Tuna Forecasting Program will receive computer products updated at 3-, 12-, and 24-hour intervals, permitting its members to monitor environmental changes almost as they occur. Significant changes observed between issuance of this forecast and commencement of the tuna fisheries will be reported as they take place in the Tuna Forecast publication, special bulletins, and Radio Station WWD daily fishing information broadcasts. As the summer season progresses, the staff expects to update and project oceanographic information and catch reports so fishermen at sea can make maximum use of available data.



"Geronimo" Sails Entire Gulf

The R/V Geronimo returned to Galveston, Texas, on March 31 after a 42-day cruise in the Gulf of Mexico. The ship sailed 6,032 nautical miles and occupied 115 oceanographic stations, none more than 40 miles apart. A number of stations included deep hauls for water at depths exceeding 3,000 meters.

This is only the second time in the history of the Gulf of Mexico that a vessel has covered it during one cruise. The first was the old "R/V Hidalgo" of Texas A&M University in February-March 1962.



The Geronimo cruise provides an excellent opportunity to begin determinations of the variability of the Gulf waters. It was never possible before.



FEDERAL ACTIONS

Rural Loan Program Includes Fisheries

The Economic Opportunity Act of 1964 authorizes the Farmers Home Administration (FHA), U. S. Department of Agriculture, to make loans to low-income farm and non-farm rural families who need small amounts to improve their earnings. These must be families living in the country, or in small towns of not over 5,500 population, with limited resources and incomes too low to cover basic needs; unable to get a loan from other sources at reasonable terms and rates; and, in nonfarm cases, furnish evidence that the service or product is not being adequately supplied by others in the community.

The loan to any one family may not exceed \$3,500--and is limited to need of family and reasonable ability to repay. Schedule of repayment is based on use made of loan and ability to repay. The loans can extend to 15 years under certain conditions. They are usually secured by a promissory note and a loan agreement. The interest rate is $4\frac{1}{8}$ percent a year on unpaid balance.

Fishermen on Florida's west coast have obtained loans for small boats (20 foot) and outboard motors, nets, supplies, and many things connected with increasing their income from fishing. Loans will be accompanied by management assistance to help borrowers make a profitable use of their resources--including assistance in planning

farm or nonfarm enterprise, budgeting, and solving other management problems.

FHA county offices will explain services available and way to prepare an application.

Cooperatives Too May Borrow

Small cooperatives serving low-income rural families may borrow from FHA (similar to conditions for families). These co-ops must be controlled and operated for members' benefit. Two-thirds of the members must be low-income rural families. Early in 1966, a group of East Coast oyster fishermen obtained a loan to organize and operate a cooperative.

Loan funds may be used by a rural co-op to provide services, supplies, or facilities not otherwise available--and which will raise income and living standards of low-income families. Eligible applicants may obtain loans for production, processing, purchasing and marketing facilities, machinery, equipment, land, and buildings. They can pay the costs of organizing a co-op and such related cost as legal, technical management, and other professional services that cannot be provided from other sources. The loans cannot exceed 30 years; interest rate is $4\frac{1}{8}$ percent. Loans are usually secured by a lien on co-op's real and personal property, including present and future inventories and assignment of co-op income.

FHA also will help community leaders and groups organize co-ops by determining feasibility, economic soundness, and cost. Organization financing and management advisory services are provided on a continuous basis to assure efficient operation and successful management of the borrower co-op.



INTERNATIONAL

Northwest Pacific Fisheries Commission

JAPAN-USSR REACH 3-YEAR KING CRAB AGREEMENT

In April, Japan and the USSR reached a long-term agreement in Tokyo on king crab fishing in the sea of Okhotsk off Kamchatka's west coast. By 1969, the Japanese catch quota will be reduced to the equivalent of 216,000 cases, and the Soviet quota will be increased to 432,000 cases (48 $\frac{1}{2}$ -lb. cans). In 1965 and 1966, the quotas were 240,000 and 420,000 cases, respectively. During 1962-1964, the quotas were 252,000 for Japan and 378,000 cases for the USSR. In 1967, catch quotas will be 232,000 and 406,000 cases; in 1968, 224,000 and 432,000.

Ratio 2 to 1 by 1969

Fleet strength and fishing area allotments will be in the ratio of 2 to 1 by 1969, the same ratio as catch quotas. For the past several years, Japan has been operating 4 factory-ships with accompanying net-setting and picker boats. The Soviet Union has operated 7 factoryship fleets but, by 1969, it will have 8.

For 1966 and for several years prior, the ratio of fishing areas was 3 to 2 in favor of the Soviet Union. For 1967 and 1968, the ratio will be changed to 7 to 4 and, in 1969, will be 8 to 4 or 2 to 1.

The Japanese agreed, reportedly, to the new provisions because of the long-term arrangement and the admitted need for conservation. (Japanese press items, April 1967.)



FAO Conducts Caribbean Training Cruises

The UN's FAO Caribbean Fishery Development Project vessels "Alcyon" and "Calamar" completed cruises in March using live-bait fishing. The Alcyon fished between Jamaica and Puerto Rico, and the Calamar in

the Southeastern Caribbean. Catches were light, although the Calamar made several sightings of sizable schools of skipjack, blackfin, and frigate mackerel. The cruise's main emphasis was to develop skills in locating and capturing bait, and to train in the live-bait fishing method. Investigations of pelagic fish resources, particularly tuna, were expected to continue through May. Then, the Calamar was to change over to trawling and the Alcyon to carry out experimental snapper fishing. The "Fregata," after its arrival in May, was scheduled to begin live-bait fishing for tuna.

The U. S. Bureau of Commercial Fisheries' "Undaunted," which had 3 project cooperators on board in late February and in early March, sighted large schools of tuna, particularly west of the Grenadines. Two of those schools, one yellowfin and one skipjack, were estimated at about 100 tons of fish each. Like the project vessels, the Undaunted had trouble attracting the tuna with live bait. (UNDP/FAO Caribbean Fishery Development Project Headquarters, Barbados, West Indies, Apr. 1967.)



Tuna Conference Scheduled for Tokyo

A conference to discuss common problems of Asian tuna fishing nations was scheduled for Tokyo, May 30 and 31. It was sponsored by the Japan National Federation of Tuna Fishermen's Cooperative Association (NIKKATSUREN). Participating were tuna industry members representing Formosa, Japan, South Korea, and Okinawa.

The agenda included: (1) tuna production, (2) management and labor, (3) administrative systems and policies for the tuna fisheries, (4) marketing and consumption, and (5) regulations of the tuna industry. The conference was scheduled originally for an earlier date but was postponed because Formosa was unable to attend. ("Nihon Suisan Shimbum," April 5, 1967, and other sources.)



Sweden and Norway Negotiate Fishing Boundaries

A Norwegian-Swedish agreement defining a fishing boundary between them in the Skagerrak Sea was signed April 5, 1967. The agreement, effective July 1, 1967, was necessitated by Norway's plan to put into effect on its east coast the 12-mile fishing limits previously authorized.

The Norwegian press reports that negotiations may soon begin with Denmark over the rights of Norwegian fishermen in waters that would be enclosed by Denmark's proposed 12-mile fishing limit. (U. S. Embassy, Oslo, April 21, 1967.)



S. Korea and Japan Report Jointly Regulated 1966 Catch

The Fishing Agencies of Japan and S. Korea have released information on the catch taken by their fishing vessels in the jointly regulated area in 1966: 50,131 tons for Japan, 41,972 tons for S. Korea.

The jointly regulated area beyond the 12-mile exclusive fishing zone of S. Korea was established by the Japan-South Korea fishing treaty. This controls number of boats and catch to conserve mackerel and horse mackerel resources and to adjust differences between the fishing capabilities of the two countries. The treaty set the annual catch quota at 150,000 tons (with a 10 percent allowable margin) for each based on catches in the past. However, in this first year (1966) after conclusion of the treaty, the catch was only a third of the quota.

Type of Fishery	Catch	
	Japan	South Korea
	.. (Metric Tons) ..	
Large trawl (50 gross tons or more) . . .	23,309	29,164
Medium trawl (less than 50 gross tons) .	6,775	10,985
Large and medium purse seine, and		
large pole & line mackerel boats . . .	20,047	1,823
Total	50,131	41,972

The large pole and line mackerel boats have been a source of dispute between fishermen of the 2 countries since the "Rhee Line." In 1966, no Japanese mackerel boats

fished in the area, although licenses were issued to 15 vessels. (Fishery Attaché, U. S. Embassy, Tokyo, April 7, 1967.)



Spain's 12-Mile Claim Will Hamper Japanese

Enactment by Spain of 12-mile fishing limits is expected to seriously hamper Japanese fishing in the former's territorial waters. As approved by the Spanish legislature on April 4, 1967, the law provides for negotiating agreements with countries whose fishermen claim historical fishing rights. However, these rights will be recognized only when the fisheries have been conducted regularly for 10 years, or the years 1953-1962.

Japan began fishing off West Africa in 1959 and would have only 4 years of actual fishing record within Spain's new fishing limits. The Japanese Government plans to renew fishing-rights negotiations with Spain. ("Nihon Suisan Shimbun," March 24, 1967, and U. S. Embassy, Madrid, March 9 and April 8, 1967.)



Japan-New Zealand 12-Mile Zone Talks Planned

Japan responded to a New Zealand note to discuss fishing within the latter's 12-mile exclusive fishing zone by proposing a meeting in late May 1967.

New Zealand's new fishing limit, which became effective January 1, 1967, prohibited foreign fishing inside the 12-mile zone. This closed her coastal waters to Japanese long-line sea-bream fishing and trawling. Unable to resolve this issue with New Zealand, Japan had intended to refer the case to the International Court of Justice. ("Suisan Keizai Shimbun," April 21, 1967.)



Soviet Fisheries Minister Visits Iceland

Soviet Fisheries Minister A. A. Ishkov visited Iceland in mid-April as a guest of the Icelandic Government. It was in exchange for the 1965 visit to the USSR of Icelandic Fisheries Minister Emil Jonsson. Ishkov was interviewed by the Icelandic press. "In response to questions on the increasing Soviet fishing activities near Iceland, he reportedly responded that these did not necessarily mean a diminution in the amount of fish the Soviets would buy from Iceland."

Soviet fish purchases are important to Iceland's economy. Soviet catches on the Icelandic Continental Shelf have been increasing.

In December 1966, the Soviets concluded an agreement with the Icelandic town of Seydisfjörður for fresh-water, hospital, and ship-repair facilities for the 400-vessel Soviet herring fleet fishing off Iceland. Also in 1966, the USSR, Iceland, and Norway agreed to conduct joint research of herring resources in the Norwegian Sea. (U. S. Embassy, Reykjavik, April 20, 1967.)



Krill May Have Potential As Human Food

The interest in krill has been growing in recent years. Some scientists see in these planktonic crustaceans and larvae a large potential food source for humans. Krill are the traditional principal food of baleen whales, which strain the water to get them. The basic idea of the scientists who believe krill can become important for humans is to step down the food chain and harvest large quantities of krill no longer needed by the reduced whale population.

Some scientists feel that the annual seasonal yield of Antarctic krill (*Euphausia superba*) could exceed the entire present world fish catch--over 50 million metric tons a year. So reports Dayton L. Alverson, U. S. Bureau of Commercial Fisheries, after discussions with scientists of several nations.

Alverson is Base Director, Exploratory Fishing and Gear Research Base, BCF, Seattle, Wash.

Tentative estimates of the annual production of Antarctic krill can be made on the basis of food intake by whales, assuming a virgin stock of 300,000 baleen whales of 40-ton average weight. One estimate is based on the observed stomach content of 1-1½ tons and assumes a clearance rate of 36 hours and 200 feeding days per year. Another estimate is based on the assumption that annual food requirements for subsistence and growth amount to 3 to 4 times the body weight; this gives figures of 120 to 190 tons of krill per year per whale, and of 36 to 57 million tons of krill eaten annually by the virgin stock of Antarctic whales. Krill have other predators, so the total stock presumably would carry an even higher exploitation by man, provided natural competitors, especially whales, are eliminated.

Choice of Whales--or Krill

A whale stock that produces its optimum yield at about two thirds of the virgin stock--but consists mainly of relatively young, fast-growing individuals--presumably would reduce the fishery potential of krill by almost the same amount as given above for the virgin stock. It might still be preferable to catch about 1 million tons of whale, rather than 500 million tons of krill, as long as economic considerations are dominant and only particularly dense populations of krill are accessible to fishing operations.

The Soviet Union carried out its first explorations for Antarctic krill in 1964-1965. Its scientists reported patches of krill concentrated in the uppermost 5 meters, which were collected by pumps or trawls. The krill were pressed fresh, the liquid extraction processed immediately into a protein concentrate, and the dry cake used for fish meal.

At present, exploitation seems only profitable in dense patches close to the surface. Often, krill are scattered down to 100 meters and migrate daily.



OECD Fisheries Committee Meets

The Fisheries Committee of the Organization for Economic Cooperation and Development (OECD) held its 17th session in Paris April 17-18. The Committee continued its reappraisal of fishery policies of member countries with emphasis on fishing fleet development over the last 8 years. Notes on the U. S., Japan, Norway, and Denmark were presented.

In other actions, the Committee reviewed reports on progress of the North Atlantic Fisheries Bio-Economic Assessment Working Group, and the compilation of fishing fleet statistics in the North Atlantic (which OECD is doing with other international organizations). It decided that OECD should try to collect more complete economic data on fishing fleets. The Committee also decided to make available for general distribution reports on electronic equipment in fishing and changes in minimum and fixed prices in the fishing industries.

The next meeting of the Committee is scheduled for September 1967. (U. S. OECD, Paris, April 26, 1967.)



Poles and British Exchange Visits

A Polish fisheries and shipbuilders delegation was scheduled to visit Great Britain in May 1967 as guests of the White Fish Authority. They were slated to visit fishing ports and markets, processing plants, fishing vessels, shipyards, and research institutes in Aberdeen and Hull.

The announcement of the visit followed closely the visit to Poland of James Johnson, Chairman of the Labor Party's Parliamentary Fisheries Committee, who was reported greatly impressed with developments in Polish fisheries. Said Johnson: "They have a completely modern fleet, the last word in design and safety. A thing that impressed me was the comfort and spacious accommodations of their ships." Johnson had been invited by the Polish Seamen's, Dockers' and Fishermen's Union. ("The Fishing News," April 14, 1967.)



Antarctic 1966/67 Whaling Season Closes

The Antarctic 1966/67 whaling quota of 3,500 blue-whale units had been reached when the season closed April 7. The results by nations were:

	No. of Expeditions	Catch of Blue-Whale Units	Date Fulfilled Quota	Production in Barrels	
				Whale Oil	Sperm Oil
Norway	2	801	Mar. 26	79,500	26,500
Japan	4	1,633	Mar. 10	182,623	11,754
USSR	3	1,069	Apr. 5	1/	1/

1/Not available.

Source: "Norsk Avalfangst-Tidende," Mar./Apr. 1967.



Tanzania Claims 12-Mile Territorial Waters

The President of Tanzania issued a proclamation on April 14, effective the preceding March 30, establishing a 12-mile limit for territorial waters. In places where the Island of Pemba is less than 24 miles from the Kenya mainland, Tanzanian territorial waters extend only to a line midway between Pemba and Kenya. (U. S. Embassy, Dar Es Salaam, Apr. 19, 1967.)



Japanese and Formosans Plan Joint Mackerel Fishing

A Japanese purse-seine fishery operator in Nagasaki and Formosan interests are planning to establish a joint purse-seine mackerel fishing enterprise in southern Formosa. A purse-seine fleet led by the "Yusei Maru No. 18" will be chartered by the joint company and dispatched to Formosa to pick up 26 Formosans for training.

Three-fourths of the mackerel landings will be canned in Formosa for export, and one-fourth marketed locally.

Two Japanese officials from Nagasaki were sent to Formosa on May 1 to complete arrangements. ("Minato Shimbun," May 3, 1967.)



FOREIGN

CANADA

NEWFOUNDLAND BAIT PRICES RAISED

On April 1, the Canadian Government raised the price of herring bait supplied to Newfoundland fishermen to 3½ Canadian cents a pound (up 1 cent). Current prices charged by the Government bait service for squid (3 cents a pound) and capelin (1½ cents a pound) were unchanged, although they will be reviewed later in the spring in the light of market conditions.

Under terms of Newfoundland's 1949 union with Canada, the Federal Government is required to supply bait to that Province's fishermen who are not adequately served by private enterprise. The service supplies about 5 million pounds annually through 21 depots and 37 holding units. A specially designed vessel and refrigerated trucks deliver supplies from depots to the units located in fishing areas. (Canadian Department of Fisheries, Ottawa, March 29, 1967.)

* * *

HERRING MEAL PLANT BEING BUILT ON EAST COAST

The construction of a herring fish meal plant in Stephenville, Newfoundland, was begun in early April. The plant reportedly will cost about C\$525,000, have an hourly capacity of 10 tons of herring, and be supplied by 2 trawlers converted to seine fishing. The plant is being financed partly by the Newfoundland Government to provide new industry for an area with substantial unemployment. Two U. S. firms will be involved in managing the plant.

Several new fish meal plants already have been established in the area. The Canadian East Coast herring catch increased from 405 million pounds in 1965 to 551 million pounds in 1966. (U. S. Consul, St. John's, April 5, 1967.)

* * *

DEMONSTRATES SCOTTISH SEINE-NET FISHING METHODS

In 1965, a program to demonstrate Scottish seine-net fishing to Canadian east coast

fishermen was begun by the Industrial Development Service, Canadian Federal Department of Fisheries, in cooperation with Provincial Fisheries Departments. In 1966, demonstrations were begun in various Canadian ports by a Scottish fishing captain. He was joined recently by another Scottish captain who will do similar work this year. Also, Canada has chartered for one year the Scottish vessel "Guiding Star" (70 feet, 152-horsepower diesel engine) to test this gear in Canadian fishing grounds. The vessel made several successful trips out of Nova Scotia last fall and winter.

Although the technique is not entirely new in the Atlantic Coast Provinces, there is a growing trend among fishermen to adopt the special Scottish techniques and gear. Both are particularly effective for catching off-the-bottom species of groundfish, such as cod, haddock, pollock, hake, and bottom-hugging species, such as flounder. The net is called a wing trawl, although different from a conventional otter trawl.

The Seine-Netting Method

Seine-netting is carried out by vessels ranging from 40 to 80 feet. Engine power requirements are low compared to bottom trawling. This method can be used by any vessel with enough deck space to tow the very long ropes that are an important part of the gear. On larger seine-netters, these ropes may exceed 3½ miles.

The vessel first sets out a buoy with a flag. One end of the rope is attached to the flag. One half of the rope is then set out in a semicircle. The funnel-shaped net is attached, and the circle completed back to pick up the buoy, while setting out the second half of the ropes. While the ropes are hauled in by a winch, the vessel tows slowly away from the net, thus closing the circle of ropes, which stir up a wall of mud and sand as they are dragged over the sea bottom. This helps lead fish into the path of the net. The net then moves forward and scoops them up. A specially designed mechanical rope coiler, attached to the winch, eases the work of hauling back the gear.

Scottish seining is similar to Danish seining, with one basic difference. With the

Canada (Contd.):

Scottish technique, the vessel tows the net; in Danish seining, the boat is anchored and the net is pulled in motion by a winch alone. Danish seining was designed to catch flounder or flatfish.

The Curriculum

The Scottish captain began last year's program with instructions to fishermen at the School of Fisheries in Caraquet, New Brunswick. He taught net construction and advised on the rigging of vessels. He supervised preliminary test fishing operations out of Caraquet aboard the "Gloucester II," and successfully experimented with seining gear on 4 different types of bottom. He supervised the rigging up of 35 Scottish seine nets.

In Nova Scotia, he sailed aboard the dragger "Acadian Pal" and fished Brown's, Georges, and LaHave banks. At that time, tides in the areas tried on the offshore banks were found too strong for practical operations with seine-net gear.

The same program is being followed this spring. The Caraquet fisheries school, northern New Brunswick fishing ports, the south shore of Nova Scotia, Cheticamp on Cape Breton Island, and Newfoundland are to be included in the program. (Canadian Department of Fisheries, Ottawa, April 24, 1967.)

* * *

FISHERIES COUNCIL URGED TO HELP BOOST CONSUMPTION

J. H. G. LeBlanc, the retiring president of the Fisheries Council of Canada, urged

that group at its annual meeting in May to increase its efforts to boost fish consumption in Canada. He said production increased 25 percent in less than 10 years, and that two-thirds of production was exported. The fishing industry is an investment of over \$205 million in vessels and gear. It employs 80,000 fishermen and 20,000 others in processing.

H. J. Robichard, Minister of Fisheries, reported that a significant development of the past 3 years has been the growth of the groundfish fisheries on the Atlantic and Pacific coasts.

* * *

CANADIAN FISHERIES MINISTER VISITS USSR

H. J. Robichard, the Canadian Minister of Fisheries, completed a 10-day tour of Soviet fishery facilities on April 5, 1967. He was accompanied by the Deputy Fisheries Minister, the Chief Scientist of the Canadian Fisheries Research Board, and 3 members of the fishing industry. The Canadian delegation visited Murmansk, Leningrad, Riga, and the Black Sea to see Soviet fishery installations.

At the end of the tour, a joint statement was issued stressing the importance of exchanging scientific information in fisheries research and the need to expand contacts between experts of both countries. The Soviet Minister has accepted an invitation to visit Canada.



LATIN AMERICA

Mexico

1967 PRODUCTION OFF TO GOOD START

During the first 2 months of 1967, Mexican production of fishery products was 46 percent higher than in January-February 1966, according to preliminary data of the Secretariat of Industry and Commerce.

Food fish (including shellfish) landings gained 35 percent. The total was 29,070 metric tons (all weights in metric tons, "as landed": heads on, heads off, cleaned, shelled, round, etc.). Most important species showed substantial gains: shrimp 6,038 tons (up 15 percent); sardine, 3,986 tons (nearly triple); anchovy, 3,459 tons (more than triple); and lobster, 439 tons (up 14 percent). Catches of other leading species were: sierra mackerel, 914 tons (equal); oyster, 3,468 tons (down 17 percent); and giant sea bass, 751 tons (down 16 percent).

Industrial fishery products gained 148 percent. The harvest of giant kelp, 3,853 tons, was 6 times as great as in 1966. Production of fish meal was 1,605 tons (up 13 percent).

Exports of shrimp were valued at US\$9,976,000, up 48 percent. If this rate can be maintained, the shipments of one of Mexico's leading export items will reach an impressive figure. (U. S. Embassy, Mexico, Apr. 15, 1967.)



Peru

REPORT ON FISH MEAL

Fish meal stocks continued high at the end of March 1967--596,275 metric tons. Production and exports for first-quarter 1967 were:

Month	Production	Exports
	(Metric Tons)	
January	287,466	100,281
February	109,644	115,673
March	163,512	117,282
Total	560,622	333,236

Exports of fish meal to principal countries for first quarter 1967 were:

Country of Destination	Exports
	Metric Tons
United States	112,564
West Germany	52,685
Netherlands	25,124
Yugoslavia	24,223
Spain	23,014
Czechoslovakia	15,399
East Germany	13,927
Poland	11,628
Others	54,672
Total	333,236

Anchovy Season Closed Earlier

As a conservation measure, the Government closed anchovy fishing earlier on the entire coast--from Feb. 15 to March 14, 1967. The objective might also have been to decrease fish meal production and with the continuation of shipments draw down stocks during those months. Unfortunately, the high Peruvian production coincided with weakening world prices and demand. The end of March saw f.o.b. Callao prices as low as US\$112 a ton to U. S. ports and \$115-\$117 to European ports. (Previous reports of prices as low as \$100 a ton were in error. Prices quoted as \$109 a ton were based on anticipated sales that did not materialize.)

Fishing conditions remained excellent in March. Fish were abundant, although their oil content was low.

In mid-April 1967, freight and insurance rates for shipments of fish meal from Peru to Gulf and East Coast ports in the U. S. were:

- a. Lots under 300 short tons - US\$29.50
- b. Lots from 300 to 999 tons - \$27.50
- c. Lots over 1,000 tons - \$24.50

According to one source, shipments to Hamburg, regardless of tonnage, were temporarily \$24.00 a metric ton, down recently from \$25.50 a ton.

The insurance rate appears to be flexible, depending on arrangements between shipper and insurance agent. According to one major marketing groups, the insurance rate was as follows:

Peru (Contd.):

- a. Peru-New York 1.75 percent c.i.f.
- b. Peru-Hamburg 2.25 percent c.i.f.

* * *

PERUVIANS OWN 2/3 OF THEIR
FISH MEAL PLANTS COMPLETELY

Political circles in Peru are concerned about the extent of foreign ownership of domestic fish meal plants. Some persons favor legislation restricting foreign ownership to 33 percent of a plant. The distribution of ownership, according to fish meal production of all plants in January 1967, was:

Foreign ownership or control	25 percent
Foreign participation (50% or less where Peruvian owners exercise veto or control) . .	8 percent
Peruvian owned.	67 percent
Total.	100 percent

* * *

ABANDONS FISH MEAL QUOTA SYSTEM

Reports from the April meeting in London of the Fishmeal Exporters Organization (FEO) say the Peruvian fish meal "quota system" has been abandoned. The system was set up to serve as a catalog of sales projections--assigning quantities of fish meal that Peruvians anticipated selling in given areas. Poor sales abroad in early 1967, however, have rendered the quota system more or less meaningless. Undoubtedly, the Peruvians will market fish meal at going prices wherever the demand exists. ("The Feed Bulletin," Chicago, Apr. 18, 1967.)



Chile

FISH MEAL PRODUCTION DROPPED
SHARPLY IN JANUARY-FEBRUARY

During January and February 1967, Chilean fish-meal production was 36,217 metric tons, compared with 60,617 tons in 1966 and 24,207 tons in 1965--down 41 percent from 1966 for the two-month period. Anchovy catches were: 1967--207,241 metric tons; 1966--353,734 tons; 1965--153,760 tons. Pro-

duction of fish oil was 2,484 tons, compared to 2,977 tons in 1966, and 2,851 tons in 1965.

Prices paid for anchovy by independent wholesalers in Arica fluctuated from US\$12 to US\$12.88 a metric ton during January and February. (BCF Branch of Foreign Fisheries, April 19, 1967.)



Panama

REPORT ON SHRIMP AND
FISH MEAL IN 1966

The 1966 shrimp catch was 12,440,440 pounds, according to first data of Panama's Bureau of Fisheries. This was about 3.6 percent below 1965 and roughly 20 percent below 1964, the record year. Unofficial preliminary data of the largest local shipping lines show that shrimp exports were about 10 million pounds worth US\$8,600,000, including an estimated 75,000 pounds of spiny lobster tails.

Premium grade "whites" taken in 1966 increased nearly 5 percent over 1965, the catch of valuable "pinks" decreased about 12 percent, but this was offset partially by the higher catch of "titi," the only other important species in Panamanian waters. So, the high percentage of premium grade shrimp in the total catch and good prices in U. S. markets pushed value of shrimp exports in 1966 to \$8.6 million, almost \$1 million and about 14 percent above 1965.

Marketing within Panama is handled by individual fishermen; sales promotion does not exist.

The bulk of the shrimp catch is transported by sea, mostly to New York. An increase in shipments to the U. S. west coast was reported in early 1967. More increases in shipments to the U. S. west coast are predicted. At the same time, shipments to the U. S. east coast will remain normal. Some production in the Chiriqui region is shipped by air to Miami.

Fish Reduction Industry

Panama's second fish meal plant started "limited" operation during second-half 1966. Understandably, this new effort was hampered by unexpected problems and delays. The

Panama (Contd.):

other company operated near capacity during 1966 and began an expansion program. When completed, it will permit doubling processing to about 80 tons of fresh fish per hour.

Aware of plans by other companies to build plants, the Minister of Agriculture recommended a ceiling on the number of fishing craft used by existing firms--and applications for official authorization to enter field. This produced Law No. 168. The fall in world prices of fish meal and fish oil reportedly is an additional factor in the official stand.

The 1966 catch of anchovy was 56,895 short tons, compared to 12,660 tons of herring.

The catch in the early months in 1967, according to government and industry, has been "poor." However, these are traditionally the poorest months. An appreciable increase was expected for April. (U. S. Embassy, Panama, March 23, 1967.)



El Salvador

UN TEAM SURVEYS FISHING INDUSTRY

A team led by Dr. Juan Cordini, an Argentine marine biologist attached to the UN Central American Fisheries Research Project, has begun a survey of El Salvador's fishing industry. The survey will cover the subsistence and commercial fishing activities. It is designed to determine the number of persons engaged in fishing, the methods used, and the fishermen's social and economic status.

The Current Situation

In general, the price of fish--40-50 cents per pound--and the fact that freezer refrigerating facilities are required limit outlets to stores and restaurants catering to wealthier customers. Sales of fish in these outlets have increased steadily in recent years.

There seems to be interest in establishing facilities to produce fish meal. Three separate proposals are being prepared for Government approval. Raw material would be the trash and other fish now caught incidental to shrimp fishing and, for the most part, discarded at sea. According to one report, Mex-

ican interests recently proposed a joint Salvadoran-Mexican company to construct facilities to handle 35 metric tons of raw fish daily. (U. S. Embassy, San Salvador, April 21, 1967.)



Colombia

JAPANESE TO EXPLORE FOR SHRIMP OFF COAST

The Japanese firm Nichiro Gyogyo reportedly was negotiating with Colombia for cooperative exploration of shrimp resources off Colombia. Nichiro plans to operate a 60-gross-ton trawler for 7 months (May-November 1967). If the operation proves successful, the company hopes to establish a joint shrimp venture with local Colombian interests. Nichiro presently operates a shrimp enterprise in Guatemala with 20 vessels. ("Shin Suisan Shimbun Sokuho," April 8, 1967.)



Cuba

LEADING MARINE BIOLOGIST JOINS BCF

Dr. Isabel C. Canet, the former director of Cuba's Fisheries Research Center who left in 1960, has joined BCF as a zoologist in the Washington, D. C., ichthyological laboratory. Dr. Canet was the driving force in Cuba's first extensive commercial exploration for shrimp with nets and trawlers. She is an international authority on shrimp. She contributed much to Cuban research on oyster growth.

Dr. Canet said the atmosphere of revolutionary turbulence made it "impossible to do reasonable work." The last straw was added with the appointment in April 1960 of a new chief of fisheries who had "no scientific background. We were told that fisheries research and education would be conducted aboard vessels rather than in laboratories," Dr. Canet said.

A serious illness provided the chance to escape. "Fortunately, I became sick," she said, "and needed medical attention in the United States." She and her family were permitted to go.

In 1966, she became a U. S. citizen and joined BCF late in the year.



EUROPE

USSR

VESSEL DELIVERY ROUTE CHANGED

Although nearly all large Soviet fishing vessels are constructed in the shipyards of European USSR, many are deployed in Pacific fisheries. In the past, the delivery route for these vessels was through the Suez Canal and the Indian Ocean to Vladivostok, and then to the fishing grounds.

Recently, however, economists of the Far Eastern Fisheries Administration calculated that the Ministry of Fisheries could save over one million rubles (US\$1.1 million) a year if the new vessels were delivered via Gibraltar, the Atlantic Ocean, Panama Canal, and then deployed immediately in Soviet Pacific fisheries off the U. S. or Mexican coasts. This would shorten the delivery route by several thousand miles with savings in vessel time and crew salaries. The old delivery route took over 2 months, but with the changed route a new vessel could be fishing in the Pacific less than a month after leaving the shipyards.

Among the large stern trawlers that recently passed through the Panama Canal were the "Fedor Krainov" (sighted in January off California) and the "Galifan Batorshin" and "Marko Reshetnikov" (both sighted fishing off U. S. coasts).

* * *

RESEARCH SHOWS FISH POSTURES ARE MEANS OF COMMUNICATION

Experiments carried out at the Ichthyological Laboratory of the Soviet Institute of Animal Morphology have shown that postures--positions fish assume while swimming--serve as means of communication. A sloped and somewhat curved body, with slightly compressed fins, indicates the presence of food. This posture is characteristic of many fish species.

Menacing poses are common in various marine and fresh-water fish. These poses are indicated by erect fins, open gill covers, gaping mouth, and an undulating movement of the dorsal and caudal fins.

Turns Bluish At Sight of Enemy

At the sight of an enemy the aquarium fish Astatotilapia strigigena (Pfeffer) takes on a bluish color. The fish spreads its unpaired fins and approaches the enemy, displaying its coloration and enlarged body contours. The opponents stay parallel to one another. A fight results if the enemy also changes its coloration and spreads its fins.

Some cichlids (these are like U. S. sun-fishes) assume a characteristic posture of defeat. With head raised, tail sunk, and fins adhering to the trunk, the surrendering fish exposes the abdomen, its most vulnerable part, to enemy attack.

Also, there are specific postures for attracting the female, summoning the young, and for signalling other fish of the school. ("Rybnoe Khoziaistvo," December 1966.)

* * *

EXPORTS FROZEN SHARK TO ITALY

The Italian Ministry of Foreign Trade has confirmed a previous authorization to import from the USSR frozen shark meat not to exceed 250 million Italian Lire (about US\$400,000) by June 30, 1967 ("La Pesca Italiana," March 9, 1967.)

* * *

CANCELS ALASKA MEETING WITH U. S.

On April 4, Coast Guard Headquarters in Alaska announced that Evgenii Gromov, Commander of the Soviet fleet fishing off Alaska, had requested a meeting with the Coast Guard and the Bureau of Commercial Fisheries to discuss the February 1967 Agreement relating to the U.S. 12-mile fishery zone. The Coast Guard's press release stated that the two U.S. agencies had agreed to the meeting, that it probably would take place near Kodiak Island, and that officials of the State of Alaska had been invited to participate.

On April 9, however, the captain of the Soviet shrimp cannery "Vasilii Putintsev" transmitted the following message to the Coast Guard: "Commander Gromov excuses himself

USSR (Contd.):

and regrets that he cannot participate in the meeting at this time." The reason given was "circumstances." (Coast Guard, April 7, 1967.)



Norway

FISHERY EXPORTS TO
EAST BLOC DROPPED 20%

In 1966, Norwegian exports to East-Bloc countries of fishery products other than fish meal and oil were worth Kr. 62.3 million (US\$8.7 million). That was a drop of 20 percent from 1965. They amounted to 5.9 percent of total fish exports in 1966, compared with 7.8 percent in 1965. Only Czechoslovakia and Hungary increased their purchases in 1966; sales to the Soviet Union, Poland, East Germany, Bulgaria, and Romania declined.

Table 1 - Value of Exports to East Bloc of Fishery Products (Excluding Fish Meal and Oil), 1965-1966

Country	1966		1965	
	Kr. 1,000	US\$1,000	Kr. 1,000	US\$1,000
USSR	26,753	3,745	35,600	4,984
Poland	33	5	1,127	158
Czechoslovakia	24,454	3,424	22,798	3,192
East Germany	7,249	1,015	14,479	2,027
Hungary	3,077	431	1,263	177
Bulgaria	-	-	1,257	176
Romania	720	101	1,240	174
Total	62,286	8,721	77,764	10,888

Fish Meal Exports Fell

Norway's exports of fish meal to East-Bloc countries fell from 31,472 metric tons in 1965 to 23,832 tons in 1966--from 12 percent to 9 percent of total fish meal exports. Czechoslovakia, Hungary, and Cuba did not buy any during 1966, while sales to East

Germany declined; only Poland purchased more in 1966 than in 1965. (U. S. Embassy, Oslo, April 7, 1967.)

* * *

PRODUCTION OF MARINE OILS
WAS UP IN 1966

Norwegian production of fish-body oil totaled 227,000 metric tons in 1966, up 36 percent from 1965. This was due to much heavier landings of mackerel and winter herring. However, output of whale oil and sperm oil declined sharply to 22,280 tons. As a result, 1966 production of marine oils was an increase of only about 20 percent above 1965.

Norway's supply of crude whale and fish body oil in 1966 included 57,906 tons on hand at the beginning of the year, and 17,697 tons imported during the year--a total supply of 319,336 tons.

Table 1 - Norwegian Production of Marine Oils, 1965-1966 and Forecast 1967

Commodity	Forecast 1967	1966	1965
	(Metric Tons)		
Fish-liver oils	12,000	12,000	11,500
Fish-body oils	200,000	227,000	167,000
Total fish-body and fish-liver oils	212,000	239,000	178,500
Seal oil	3,000	4,100	2,700
Sperm oil:			
Antarctic	4,000	5,271	9,869
Shore stations, Norway	170	276	177
Total sperm oil	4,170	5,547	10,046
Whale oil:			
Antarctic	13,523	16,384	29,877
Shore stations, Norway	400	349	654
Total whale oil	13,923	16,733	30,531
Total marine oils	233,093	265,380	221,777

Of that total, 89,831 tons were exported, and an estimated 165,742 tons were processed by the domestic hardening industry. This left stocks on hand at the end of 1966 of 63,763

Table 2 - Exports of Fish Meal to the East Bloc, 1965-1966

Country	Quantity		Value			
	1966	1965	1966		1965	
	(Metric Tons)		Kr. 1,000	US\$1,000	Kr. 1,000	US\$1,000
Poland	13,992	6,115	18,341	2,568	7,847	1,099
Czechoslovakia	-	8,147	-	-	14,950	1,673
East Germany	9,840	13,054	13,134	1,839	18,063	2,529
Hungary	-	2,156	-	-	2,946	412
Cuba	-	2,000	-	-	2,890	405
Total	23,832	31,472	31,475	4,407	43,696	6,118

Norway (Contd.):

Table 2 - Norwegian Crude Whale and Fish Body Oils Supply and Disposition, 1965-1966		
	1966	1965
	.. (Metric Tons) ..	
Supply:		
Opening stocks, January 1	57,906	85,214
Production:		
Whale oil	16,733	30,531
Fish-body oil	227,000	167,000
Total	243,733	197,531
Imports:		
Whale oil	2,952	4
Fish-body oils	14,745	10,737
Total	17,697	10,741
Total supply	319,336	293,486
Disposition:		
Exports:		
Whale oil	8,990	13,329
Fish-body oil	80,841	32,960
Total	89,831	46,289
Processed by hardening industry ^{1/} . .	165,742	189,291
Ending stocks, December 31	63,763	57,906
Total disposition	319,336	293,486
^{1/} Arrived at by deducting ending stocks and exports from "Total Supply."		
Sources: Norwegian Central Bureau of Statistics, Oslo, and The International Association of Whaling Companies, Sandefjord.		

tons. The United Kingdom is the leading market for Norwegian marine oil. (U. S. Embassy, Oslo, April 14, 1967.)

* * *

INTEREST IN FISH PROTEIN CONCENTRATE GROWS

Under Secretary Fjaervoll of the Norwegian Ministry of Fisheries said in a newspaper interview on April 18 that herring protein concentrate for human consumption would be the primary concern of a special committee to be set up by the Norwegian Export Council. The committee will organize the export of high-protein fish products and maintain close contact with the Ministry of Fisheries.

The Norwegian interest in fish protein concentrate (FPC) reportedly is related to approval by the U. S. Food and Drug Administration of FPC made from whole hake.

Norway has developed and publicized a fish paste as a low-cost food. However, it contains only 11 percent protein; its water content is 50-60 percent. (U. S. Embassy, Oslo, April 26, 1967.)



Denmark

EXPORTS OF FISHERY PRODUCTS TO U. S. ROSE CONSIDERABLY

Danish exports of edible fishery products to the U. S. rose substantially in 1966, due mainly to a 46-percent gain in frozen cod fillets and blocks--the bulk of exports there. About half the cod exports were shipped directly from Greenland. Heavier landings of cod in Greenland, and higher prices on the world market early in 1966, stimulated production for export. However, the price for frozen cod blocks in the U. S. declined from about 29 to 22 cents per pound during 1966. The U. S. imported about half of Danish exports of cod fillets. The United Kingdom and Sweden also were important buyers.

Table 1 - Danish ^{1/} Exports of Edible Fishery Products to the U. S., 1965-1966						
Commodity	1966			1965		
	Qty.	Value		Qty.	Value	
	Metric Tons	Kr. 1,000	US\$ 1,000	Metric Tons	Kr. 1,000	US\$ 1,000
Fresh & Frozen:						
Cod fillets.	15,372	57,387	8,321	10,536	39,331	5,703
Pond trout.	502	3,604	523	699	4,115	597
Other.	971	7,091	1,028	1,359	10,398	1,506
Total fresh & frozen. . .	16,845	68,082	9,872	12,594	53,835	7,806
Canned.	835	5,425	787	817	5,049	732
Semipreserved.	57	540	78	37	421	61
Salted & smoked.	13	66	9	54	228	33
Total edible products. . .	17,750	74,113	10,746	13,502	59,533	8,632
^{1/} Includes direct shipments from Greenland.						

Table 2 - Danish Exports of Fresh and Frozen Cod Fillets, by Country, 1966		
Country	1966	1965
	. . . . (Metric Tons)	
United States	15,372	10,536
United Kingdom	4,521	6,189
Sweden	4,004	3,709
Switzerland	1,848	1,887
Italy	1,095	1,120
Other countries	4,015	4,139
Total	30,855	27,580
Source: Danish Ministry of Fisheries.		

Among other principal fishery exports to the U. S., pond trout and canned shrimp were down, while canned herring increased slightly.

Exports of industrial fishery products to the U. S., which consist principally of fish solubles, amounted to 541 metric tons in 1966 and 600 tons in 1965. (U. S. Embassy, Copenhagen, April 12, 1967.)



United Kingdom

1966 LANDINGS REACHED 2 BILLION POUNDS

Landings of fish (excluding shellfish) in England, Wales, and Scotland totaled 2 billion pounds in 1966, a gain of about 2 percent

from 1965's 1.96 billion pounds. Cod landings in England rose in 1966, probably as a result of the increased capacity of the long-range freezer-trawler fleet, which concentrates on cod.

Haddock landings declined in both England and Scotland. Herring landings were up substantially in Scotland but down in England.

Table 1 - Landings of Principal Species in England and Wales, 1965-1966^{1/} (Does Not Include Scotland)

Species	1966			1965		
	Quantity	Value		Quantity	Value	
	1,000 Lbs.	£1,000	US\$1,000	1,000 Lbs.	£1,000	US\$1,000
Cod	614,203	21,310	59,668	593,141	21,110	59,108
Haddock	122,465	4,801	13,443	136,675	5,397	15,112
Plaice	74,967	5,125	14,350	73,941	4,926	13,793
Saithe (coalfish)	79,609	1,322	3,702	81,899	1,364	3,819
Hake	5,788	780	2,184	9,167	1,077	3,016
Herring	28,697	450	1,260	33,727	621	1,739
Other fish	185,430	5,426	15,193	209,992	5,835	16,338
Total (excluding shellfish)	1,111,159	39,214	109,800	1,138,542	40,330	112,925

^{1/}Preliminary.

Source: British Ministry of Agriculture, Fisheries, and Food.

Table 2 - Landings of Principal Species in Scotland, 1965-1966

Species	1966			1965		
	Quantity	Value		Quantity	Value	
	1,000 Lbs.	£1,000	US\$1,000	1,000 Lbs.	£1,000	US\$1,000
Cod	102,276	3,748	10,494	104,024	3,914	10,959
Haddock	212,946	6,029	16,881	234,877	5,451	15,263
Whiting	99,845	2,209	6,185	88,895	1,469	4,113
Herring	223,718	2,401	6,723	182,278	2,277	6,376
Other fish	257,897	4,380	12,264	213,286	4,397	12,312
Total (excluding shellfish)	896,682	18,767	52,547	823,360	17,508	49,023

^{1/}Preliminary.

Source: Department of Agriculture and Fisheries for Scotland.

Table 3 - British Imports of Fishery Products, 1965-1966^{1/}

	1966			1965		
	Quantity	Value		Quantity	Value	
	1,000 Lbs.	£1,000	US\$1,000	1,000 Lbs.	£1,000	US\$1,000
Finfish products:						
Groundfish:						
fresh	131,040	7,209	20,185	121,632	7,108	19,902
chilled or frozen	121,520	14,025	39,270	147,840	15,677	43,896
Herring:						
fresh	11,536	204	571	10,304	190	532
chilled or frozen	4,928	134	375	2,464	58	162
Salted, dried, or smoked	11,424	769	2,153	11,200	720	2,016
Canned	137,760	28,086	78,641	154,336	34,615	96,922
Fish meal	691,264	21,221	59,419	808,416	22,572	63,202
Other fish products	439,600	13,956	39,077	495,600	17,454	48,871
Total fish products	1,549,072	85,604	239,691	1,751,792	98,394	275,503
Shellfish:						
Frozen	10,304	3,953	11,068	9,184	3,126	8,753
Fresh	4,592	457	1,280	8,400	527	1,476
Canned	12,320	4,480	12,544	12,208	4,311	12,071
Other shellfish products	7,728	2,299	6,437	4,928	925	2,590
Total shellfish products	34,944	11,189	31,329	34,720	8,889	24,890
Grand total all fishery products	1,584,016	96,793	271,020	1,786,512	107,283	300,393

^{1/}Preliminary.

Source: "Fishing News," London, Feb. 24, 1967.

United Kingdom (Contd.):

Set Exvessel Value Record

The 1966 landings of fish and shellfish in the United Kingdom yielded a record exvessel value of £61.4 million (US\$171.9 million). In 1965, the value was £60.7 million (\$170 million).

While British landings of frozen cod increased, imports of frozen groundfish declined noticeably. Imports of canned fish and fish meal also were down, according to preliminary data.

* * *

FISH MEAL FUTURES MARKET OPENS IN LONDON

A fish meal futures market opened in London on April 12 with rules similar to New York's futures market. Contracts on both markets are based on delivery of Peruvian and Chilean fish meal at Hamburg, Germany. However, the London market allows substitution of South African or Angolan meal at a reported discount of \$2.80 a ton. Trading units in London are 25 metric tons as against 100 metric tons in New York. ("London Financial Times," April 11 and 13, 1967.)

The London Exchange closing prices (in U. S. dollar equivalents) on opening day and a month later are shown below:

London Fish Meal Futures Prices			
Delivery Period	Bidding Dates		
	May 15, 1967	April 12, 1967	
	. . . . . (US\$ a Metric Ton)		
Sept. 1967	140.80	148.40	
Nov. 1967	143.00	149.50	
Jan. 1968	145.00	150.90	
Mar. 1968	145.30	152.30	
Source: "Journal of Commerce," May 16, 1967.			
Note: US\$2.80 equal £1.00.			

* * *

ANNUAL REPORT ON FISHERIES RESEARCH ISSUED

"Annual Report of the Director of Fishery Research, 1966" has been issued by the British Ministry of Agriculture, Fisheries, and Food. It describes work on bottomfish populations, pelagic fisheries, fish behavior and fish physiology, fish cultivation, shellfish

studies, gear research, and pollution problems. It also describes British research facilities, which include the Fisheries Laboratory, Lowestoft; the Radiobiological Laboratory, Lowestoft; the Fisheries Laboratory, Burnham-on-Crouch; and the Fisheries Experiment Station, Conway.

A particularly interesting section describes work on bottomfish stock assessment. The annual British summary of groundfish resources is based on it. The latest British "Fish Stock Record" showed that in 1965 the cod, haddock, and plaice stocks of the North Sea contained outstanding year-classes. It was anticipated that catches in those fisheries would remain relatively high for a year or two. The distant-water forecasts were: (1) the northeast Arctic stocks might begin to recover following a period of depletion that was sufficient to divert fishing effort to other areas; (2) the Newfoundland cod stock is strong and, at Labrador, the fishery is expanding; and (3) at West Greenland, the prospects are clouded because of unexpectedly heavy destruction of young cod.



Italy

MAY HELP DEVELOP AUSTRALIAN INDUSTRY

A "multi-million dollar cooperation scheme" to develop the Australian fishing industry into a minor export earner was disclosed by an Italian trade mission after talks with the Commonwealth Government in mid-February 1967. The scheme proposes a joint venture of private Italian and Australian capital and, hopefully, Government investment, to build a fleet, develop canning and freezing facilities, and supply machinery.

The first step is to develop an industry to supply the local market, which imports over A\$40 million (US\$44.8 million) worth of fish a year, and to export fish to Italy, one of the world's biggest buyers. This project could supply considerably more than A\$10 million (US\$11.2 million) worth of fish a year. ("The Australian," Feb. 21, 1967.)

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TUNA PACKERS SEEK JAPANESE SUPPORT

The Italian Tuna Packers Association reportedly asked the Japanese Frozen Tuna



Portugese fishermen pulling in their nets. (Photo: USIA/National Archives.)

Italy (Contd.):

Producers Association to help finance a promotion campaign to overcome depressed sales resulting from removal of meatless-Friday restriction by the Roman Catholic Church. The Japanese said they were willing to cooperate but that other suppliers of tuna to Italy should also participate.

In 1964, Italy first sought Japanese support for its promotion program. ("Nihon Suisan Shimbun," April 3, 1967; "Suisan Tsushin," March 29, 1967.)



Portugal

1966 CANNED FISH PACK DROPPED 18%

The Portuguese pack of canned fish in oil or sauce in 1966 was down 18 percent on a weight basis from 1965. Excepting anchovy fillets, the packs of all leading items dropped, including the important sardine pack. ("Conservas de Peixe," February 1967.)

Product	1966		1965	
	Metric Tons	1,000 Cases	Metric Tons	1,000 Cases
<u>In oil or sauce:</u>				
Sardines	52,386	2,757	56,147	2,955
Chinchards	1,198	63	2,330	122
Mackerel	6,438	257	13,055	522
Tuna & tunalike	4,117	137	7,253	242
Anchovy fillets	4,859	486	4,232	422
Others	947	50	1,838	96
Total	69,945	3,750	84,855	4,359

* * *

1966 CANNED FISH EXPORTS DECLINED 9%

Portugal's exports of canned fish in oil or sauce in 1966 were down about 9 percent from 1965, due mainly to lower shipments of sardines.

Product	1966		1965	
	Metric Tons	1,000 Cases	Metric Tons	1,000 Cases
<u>In oil or sauce:</u>				
Sardines	55,778	2,935	61,383	3,230
Chinchards	869	46	2,667	140
Mackerel	10,096	404	10,310	412
Tuna & tunalike	2,833	94	3,456	115
Anchovy fillets	4,375	438	3,654	365
Others	817	43	794	42
Total	74,768	3,960	82,264	4,304

Her principal canned fish buyers were: Italy, 12,669 metric tons; Germany, 10,632 tons; the United Kingdom, 9,484 tons; France, 7,494 tons; U. S., 6,390 tons; and Belgium-Luxembourg, 5,283 tons. Germany's purchases of canned fish were down 43 percent from 1965. ("Conservas de Peixe," February 1967.)



Poland

1966 REPORT ON FISH MEAL PRODUCTION AND IMPORTS

In 1966, Poland's available supply of fish meal was 82,000 metric tons, or about 10 percent above 1965. However, domestic output of fish meal is still low--only 14,800 tons were produced in 1966, mostly aboard fishing vessels on the high seas.

Production and Imports of Fish Meal, 1965-1966			
	1966	1965	Percentage Increase
	(Metric Tons)		%
<u>Domestic production:</u>			
Aboard vessels	10,122	7,175	41.1
Shore plants	4,678	4,925	5.0
Total domestic	14,800	12,100	22.3
Imports	67,162	62,870	6.8
Total supply	81,962	74,970	9.3

Seeks Increased Production

Poland is making a great effort to increase the production of fish meal from raw inedible fish, or from fish offal, aboard stern factory trawlers. In 1966, they were quite successful. This type of fish-meal production increased by 41 percent, although it represented only one-eighth of the year's fish-meal needs. It is going to increase further.

In early 1967, the first processing mothership, "Gryf Pomorski," was added to the fleet. It is a shelterdeck vessel of 13,000 gross tons, with crew of 260, equipped with 2 fish and offal reduction plants--each can handle daily 50 metric tons of raw material. Also, the 5-Year Plan (1966-1970) provides for construction of 16 large stern factory trawlers (each about 3,000 gross tons) equipped with fish-meal reduction plants.

The need for fish meal is expected to grow considerably in the next few years,

Poland (Contd.):

and it will take time before increased production will satisfy it.

In 1966, Poland's fish meal imports increased even faster (about 4,300 metric tons) than domestic output (only 2,700 tons). It is believed, however, that in the long run this trend will be reversed, if for no other reason than to conserve vitally needed hard foreign currencies.



Romania

JOINS EAST EUROPEAN FISHERIES AGREEMENT

On February 28, Romania officially adhered to the Agreement on Cooperation in High-Seas Fisheries concluded between the Soviet Union, Poland, and East Germany, and signed in Warsaw on July 28, 1962. (U. S. Embassy, Bucharest, Mar. 24, 1967.)

The Agreement, administered by a Joint Mixed Commission, stipulates close collaboration among the signatory powers in fishery research, fisheries technology, and development of joint high-seas operations. The Commission reportedly also forecasts fishery stocks in the Northwest Atlantic and coordinates fishery research there.

Actually, the Romanians have been participating in activities of the group since 1965.



New Book Surveys Small and Medium Vessels

A book devoted mainly to vessels of 100 tons and under has been published by Fishing News (Books) Ltd., 110 Fleet St., London,

E. C. 4, England. Entitled "Fishing Boats of the World: 3," it was produced under an arrangement with the Food and Agriculture Organization (FAO). Price: \$23.50 to U. S. residents, including postage.

The book resulted from FAO Fishing Boat Congress held in Gothenburg, Sweden, in October 1965. It has 6 sections: (1) the social and economic factors in boat building; (2) performance of various vessels; (3) materials used in construction; (4) engineering; (5) design of small vessels; and (6) recent developments and new trends.

The performance section includes a statistical analysis of resistance data for medium fishing craft. It also discusses how computers can be used when designing fishing vessels of low resistance and good stability.

The section on materials reviews construction with wood, aluminum, plastic, and fiberglass-reinforced plastic. It compares plastic and conventional materials.

Engineering problems discussed in the fourth section are related to engine location, engine types, deck machinery, and refrigeration equipment.

The final section discusses new craft for stern trawlers, tuna vessels, and combination vessels.

Two earlier volumes in this series were also published by Fishing News (Books) Ltd., London, under an arrangement with FAO: "Fishing Boats of the World" (1955), Price: \$21.50. This contained a great deal of basic information on fishing vessel design and operation; and "Fishing Boats of the World: 2" (1960), Price: \$22.50, which gave detailed attention to tactics in fishing, vessel construction, sea behavior of vessels, and productivity. All three volumes were the outcome of FAO Fishing Boat Congresses. The editor of all three is Jan-Olof Traung, Chief, Fishing Vessel Section, FAO Department of Fisheries, Rome.



ASIA

Japan

ADOPTS FISHERIES "WHITE PAPER"

The Japanese Cabinet, at its April 4 meeting, adopted the "1966 Annual Report on Fishery Trends" for submission to the Diet. Called the "Fisheries White Paper," the report describes the supply, demand, and prices of fishery products, as well as production, management, employment, and financial trends in the fisheries, primarily for 1965.

Highlights of the 1966 annual report:

1. Supply, demand, and prices of fishery products

Consumption of processed products is increasing, and consumer preference leans toward higher-priced fresh and processed products. Domestic supply of fishery products is becoming increasingly inadequate and, to meet growing demand, production must be increased. Both exports and imports of fishery products in 1965 reached new highs: 119 billion yen (US\$330.6 million) in exports, and 37.4 billion yen (\$103.9 million) in imports. (Note: 1964 exports totaled \$311 million and imports \$89.7 million.) Canned salmon and pearls primarily accounted for the export gains, purchases of shrimp and fish meal contributed to the increase in imports. Fish prices rose both in distribution and consumer areas; the rate of increase was higher in consumer area due to rising transportation costs and growing demand.

2. Production trends

Fishery production in 1965 was 6.91 million metric tons (excluding whales) worth 556.2 billion yen (US\$1,545 million). This was an increase of 8.8 percent in quantity and 11.8 percent in value over 1964. Good catches of bottomfish and bulk fish (such as squid, saury, and mackerel) in 1965 raised production above 1962's high of 6.86 million tons. Long-line tuna production in 1965 totaled 498,000 tons, compared with 507,000 tons in 1964; salmon accounted for 115,000 tons, a 22.3-percent increase over 1964.

Annual income of fishery households in coastal fisheries averaged 790,000 yen (\$2,194) in 1965, slightly less than in 1964.

Average annual income of fishery households with 3- to 5-gross-ton vessels was 864,000 yen (\$2,400) in 1965, surpassing income level of city laborers.

3. Management and employment trends

The number of fishery managements on January 1, 1966, was 224,000 units, a 2.2-percent decline from a year earlier.

The number of people engaged in the fisheries, which is decreasing annually, totaled 612,000 in 1965. In the coastal fisheries, over half the fishermen were over 40; the average age is increasing. To retain younger people, better working conditions aboard vessels and higher pay are necessary.

4. Financial loans to fisheries

All commercial and government loans to the fishing industry at end of fiscal year March 31, 1966, totaled 434.5 billion yen (\$1,207 million), down 10 percent from the preceding fiscal year. The rate of increase in loans was the lowest in five years. This was due particularly to a decline in investments by medium and small fishery operators, who began withholding investments in 1963-64, a recession. ("Suisan Keizai Shim-bun," April 5; "Shin Suisan Shim-bun Sokuho," April 5, 1967.)

INCREASES FISHERY PRODUCTS EXPORT TARGETS FOR FY 1967

The Japanese Government held a meeting on April 10 and 11 of the Agricultural and Fishery Products Export Council (government

FY 1967 Export Targets for Fresh and Frozen Fishery Products						
Product	1967		1966		1967/1966	
	Target		Actual Exports		Percentage	
	Qty.	Value	Qty.	Value	Qty.	Value
	Metric Tons	US\$ 1,000	Metric Tons	US\$ 1,000	%	%
Tuna	200,000	62,000	162,728	77,158	122.9	80.4
Swordfish . .	7,000	5,200	6,647	5,621	105.3	92.5
Rainbow trout	2,200	2,200	2,052	1,910	107.2	115.2
Shrimp	2,500	5,000	2,460	5,098	101.6	98.1
Molluscs . . .	8,000	2,700	8,997	2,551	100.0	105.8
Others	80,000	24,000	65,251	19,936	122.6	120.0
Total	300,700	101,100	248,135	112,274	121.1	90.0

Japan (Contd.):

FY 1967 Export Targets for Canned Fishery Products						
Product	1967		1966		1967/1966	
	Target		Actual Exports		Percentage	
	Qty.	Value	Qty.	Value	Qty.	Value
	Cases	US\$ 1,000	Cases	US\$ 1,000	%	%
Tuna...	5,500,000	48,880	4,929,838	44,721	111.6	109.3
Salmon ..	1,032,500	36,554	1,199,559	42,751	86.1	85.5
Crab ..	334,000	8,978	351,678	9,877	94.9	90.9
Sardines	220,000	1,644	172,966	1,211	127.2	135.7
Saury ..	700,000	4,550	540,829	3,348	129.4	136.0
Mackerel	700,000	4,275	710,055	4,567	98.6	93.6
Others ..	4,810,000	28,280	4,757,607	28,955	101.0	97.7
Total.	13,296,500	133,161	12,662,632	135,430	105.0	99.1

and industry members) to set fiscal year 1967 (April 1967-March 1968) export targets for canned and frozen agricultural and fishery products. The export targets for fishery products, which will be submitted for approval to the Supreme Export Council (headed by Prime Minister) total 300,700 metric tons of fresh and frozen fish valued at US\$101,100,000, and 13,296,500 cases of canned fishery products worth \$133,161,000. ("Suisan Tsushin" and "Suisan Keizai Shimbun," April 13, 1967; "Kanzume Nippo," April 14, 1967.)

* * *

REPORT ON MEAL AND OIL

The demand for oilseed meals, especially soybean meal, continued to increase in 1966. The reasons were increasing poultry and livestock feed requirements, and decreased imports and domestic production of fish meal. This year, the production of oils from domestic oilseed crops and from whaling is expected to decline further.

On the other hand, oil requirements are expected to continue increasing. In view of the expected increase in feed protein requirements being generated by the developing poultry and livestock industries, the demand for oilseed cake and meal is expected to continue the upward trend of recent years.

The use of fish meal, mostly for feed, in 1966 declined to 427,000 metric tons, 7 percent below 1965. Production dropped to 347,000 metric tons, but imports declined to 96,000 metric tons, or by 15 percent from 1965. Imported fish meal is under the import allocation system, and programs are de-

cided for each half of the fiscal year after discussion between the government's Livestock Bureau and Fisheries Agency and interested groups, such as Feed Manufacturers Association and Aquatic Oil Association,

Why Imports Declined

Reasons for decreased imports in 1966 were: (1) Higher world prices at the beginning of 1966; (2) increased use of methionine as additive to oilseed meal, which reduced the need of animal protein in mixed feed manufacturing. If prices of oilseed meal remain relatively lower than fish meal this year, it is expected that imports of fish meal will decline still further.

Total production of marine oil in 1966 declined 37 percent: fish oil, whale oil, and fish-liver oil dropped 4,000 metric tons, 45,000, and 700, respectively. Early in April 1967, 3 major whaling firms reportedly had contracted with Unilever of the Netherlands to sell all of 34,000 metric tons of whale oil scheduled for export at £60 (US\$168) c.i.f. per long ton, or about £30 (\$84) lower than 1965's price. This would be the second lowest export price in the whaling industry's history. Reasons for this sharp price decline reportedly are: increased world production of fish oil, especially by Peru and Norway, and disappearance of many fats and oils enterprises in Western Europe, leaving only one major ready buyer. Domestic consumption of whale oil in processed food also has been declining.

Consumption of margarine and shortenings has been increasing rapidly because of improvement in quality and a rather tight supply of butter. To improve quality, manufacturers have increased the vegetable oils content and decreased percentage of animal fats and oils. The use of soybean oil, which has been rather small, appears to be increasing at a substantial rate. (Agricultural Attaché, U. S. Embassy, Tokyo, April 17, 1967.)

* * *

ARTICLE DISCUSSES 1967
OUTLOOK FOR EXPORT OF
CANNED FISHERY PRODUCTS

Japan's export of canned tuna (white meat) in 1967 depends entirely upon production, writes the Vice Chief, Fisheries Department,

Japan (Contd.):

Mitsubishi Trading Company, appearing in "The Cannery Journal" of January 1967. Sales will not be easy because the cost of white meat is high due to a shortage of raw fish and a narrow market for canned light meat. It will be necessary, therefore, for both producers and trading firms to promote sales because of the importance of canned tuna in the total exports of canned goods.

The article discusses prospects to attain the export target for fiscal year 1967; outlook for export by months of major commodities: canned tuna, salmon, crab meat, sardine, horse mackerel, saury, mackerel, and shellfish (mainly oysters and baby clams). It also contains two tables showing actual exports for April-September 1966 and the forecast for the October-March period.

A loan copy of this report, translated by the U. S. Embassy, Tokyo, is available only to firms in the United States. To borrow "Outlook for Export of Canned Fishery Products for 1967," dated January 1967, write to Branch of Foreign Fisheries, BCF, Room 8015, U. S. Department of the Interior, Washington, D. C. 20240.

* * *

FISHING VESSEL CONSTRUCTION
ROSE IN 1966

Vessel construction licensed by the Japanese Fisheries Agency during April-December 1966 was 807 fishing vessels totaling 117,753 gross tons, up 35 percent in number and 85 percent in gross tonnage over the 1965 period. The sharp increase in tonnage was due primarily to the construction of many distant-water trawlers.

Tuna vessel construction licensed in the 1966 period rose sharply too--surpassing 1965 figures by 85 percent in number and 117 percent in tonnage. However, construction of steel tuna vessels in 1965 had declined markedly from 1964. On the whole, vessel construction in FY 1966 (ending March 1967) was expected to reach about 1,100 vessels of 140,000 gross tons, which would exceed the previous 5-year average of 1,038 vessels of 126,000 gross tons. ("Suisan Shuho.")

* * *

SUMMER ALBACORE SEASON
STARTS SLOWLY

The Japanese summer albacore fishery was off to a slow start because pole-and-line vessels operating in the central-west Pacific continued to have good skipjack fishing and only a few vessels had begun scouting for albacore. A good albacore run was expected to develop from mid-April until June.

The Fisheries Research Institute, Tokai University (Shimizu), in its first summer forecast for 1967, has predicted a good albacore tuna season in Japan. It pointed to the development of oceanographic conditions closely resembling those of 1965, a year of excellent catches. (Japanese summer albacore landings in 1965 totaled about 42,000 metric tons; in 1964, 24,000 tons; in 1966, 18,000 tons.)

The first 1967 summer albacore landings (about 60 metric tons) were unloaded at Yaizu and Shimizu and sold to local canneries at 150-160 yen a kilogram (US\$378-403 a short ton). ("Suisan Keizai Shimbun," April 11, 1967; "Suisan Tsushin," April 12, 1967.)

* * *

TO INCREASE PACK OF
CANNED TUNA IN OIL

Japanese tuna packers, anticipating a good summer albacore season, plan to increase production of canned tuna in oil for the domestic market. They foresee a drop in albacore prices to where it would be sufficiently profitable to pack albacore in oil for domestic sale.

As in 1966, a promotion campaign to increase domestic demand for albacore and to help stabilize tuna prices is being conducted by the Japan Federation of Tuna Fishermen's Cooperative Associations (NIKKATSUREN). ("Kansume Nippo," Apr. 15, 1967.)

* * *

EXPORTERS' AGREEMENT REACHED
FOR CANNED TUNA IN BRINE

Following months of negotiations with the Tuna Packers Association, the Japan Canned Foods Exporters Association adopted on March 24 the new Exporters Agreement

Japan (Contd.):

governing exports of canned tuna in brine to the U. S. for business year 1967 (April 1967-March 1968).

The new agreement provides for an export quota of 3 million cases for BY 1967: 2.9 million cases will be allocated to exporters on past performance and 100,000 cases were unassigned. ("Suisan Tsushin," March 25, 1967.)

* * *

GOVERNMENT APPROVES TUNA EXPORT QUOTAS FOR OVERSEAS BASES

The Japanese Fisheries Agency approved for fiscal year 1967 (April 1967-March 1968) an export quota of 48,000 short tons for the 5 overseas tuna bases operated by fishing firms.

Overseas Base	Firm	Export Quota
		<u>Short Tons</u>
Samoa, American	Chuo Gyogyo Kosha	9,000
	Nippon Reizo	6,000
	Nichiro	6,000
	Kanagawa Prefectural	4,000
	Tuna Fishery Cooperative	
Espiritu Santo (New Hebrides)	Taihei Suisan	6,000
Fiji Islands	South Pacific Fishery Cooperative Assoc.	9,000
Penang (Malaysia)	Overseas Fisheries Cooperative Assoc.	6,000
St. Martin Is. (Netherlands Antilles, West Indies)	Nippon Reizo	2,000

("Nihon Suisan Shimbun," April 5, 1967.)

* * *

WHALE OIL PRICE DROPS

Japan's "big three" fisheries companies reportedly concluded a joint contract to export about 34,000 metric tons of whale oil to a Dutch firm.

The commitment was made for about US\$166 c.i.f. per metric ton, considerably lower than they offered last year in European markets, and the lowest export price since 1962. The 1966 price was \$258 per ton.

Dutch Firm Reportedly Cornered Market

The bargain price was due to last year's sharp increase in fish oil production and the lack of buying interest by European oil and fat firms in Japanese whale oil.

The Dutch firm reportedly cornered the Japanese oil--beating down the 3 firms' selling offer to the low price.

The slump in whale oil prices will be a heavy blow to the Japanese firms because the annual whale catch has fallen to one-third that of several years ago. ("The Yomiuri," Mar. 28, 1967.)

* * *

FROZEN TUNA EXPORT PRICES DROP

Prices of frozen tuna and loins for direct export to the U. S. and Canada in March 1967 declined for all species, according to the Japan Frozen Tuna Producers Association. Export prices (c.i.f.) especially for albacore loins declined sharply--almost \$300 a short ton--from a high of \$1,150 a ton in early March to a low of \$829 at month's end. Price ranges for about 4,000 tons of frozen tuna and loins exported to U. S.-Canada during March 1967 were:

Kind of Tuna	March 1967 C.i.f. Export Prices		
	High	Low	Average
	... (US\$/Short Ton) ...		
Albacore, round.	450	420	446.60
Yellowfin, g. & g.	425	380	401.66
Albacore loins.	1,150	829	912.33
Yellowfin loins.	790	710	772.54

California fishermen were making good yellowfin tuna catches and Italian tuna packers were not buying, so Japanese frozen tuna export prices continued to decline in early April. Several trading firms have recently sold gilled-and-gutted yellowfin to U. S. buyers at US\$375 a short ton. c.i.f. Albacore tuna prices for direct exports to the U. S. have dropped below \$380 a short ton f.o.b.

Japanese tuna industry circles are very pessimistic about the present export market situation--particularly because major frozen tuna producers are said to be carrying large quantities of unsold tuna in their cold storages. ("Suisancho Nippo," April 6, 1967; "Suisan Tsushin," April 12 & 17.)

* * *

CONCERNED OVER EXPANDING S. KOREAN AND FORMOSAN TUNA FISHERIES

The expansion of S. Korean and Formosan fishing fleets in the Pacific, Atlantic, and Indian Ocean in recent years, already

Japan (Contd.):

outnumbering the Japanese vessels in some fishing grounds, is causing great concern within the Japanese tuna industry. Some industry members fear a sharp decline in tuna prices on the international market once S. Korea and Formosa, whose fishermen now deliver catches to Japanese trading firms, begin handling their own exports. These industry members are urging Japan to develop measures immediately for this eventuality. They say Japanese tuna producers are restricted as to landings and transshipment of catches. Moreover, they must reduce vessel operating costs to compete successfully abroad. But the S. Koreans and Formosans face no such restrictions, and their substantially lower labor costs enable them to sell catches at lower prices. ("Katsuo-maguro Tsushin," March 27, 1967.)

* * *

SALMON FISHERMEN TO CANCEL JOB CONTRACTS WITH S. KOREAN FIRM

The 21 Japanese salmon fishermen recruited by a South Korean salmon fishing firm will be able to cancel their contracts formally. Their employment was barred by the Japanese Government.

They had received a total of about 3 million yen (US\$8,333) as advance pay, spent most of it and so were unable to cancel their contracts. But it was reported that sufficient money to pay back this amount had been raised for them by Japanese salmon organizations. ("Suisan Tsushin," March 24, 1967.)

* * *

FIRM AGAIN WILL FISH ARCTIC SALMON

The Japanese Government is expected to license only one firm (Hoko Suisan) for the 1967 experimental salmon fishing in the Chukchi Sea north of 66° N. latitude. Over 10 other firms applied for fishing licenses, but the Soviet warning at the Japan-USSR fishery negotiations in Tokyo early this year makes it almost certain that Japan will not authorize more than one firm.

In 1966, Hoko Suisan initiated the Arctic operations. It sent the "Dairin Maru No. 8" (204 gross tons) to the Chukchi Sea, where about 85 metric tons of chum salmon were

caught. But this year the firm plans to use a 300-ton vessel. ("Suisan Tsushin, Apr. 14, 1967.)

* * *

LARGE STERN TRAWLER TO EXPLORE OFF U. S. EAST COAST

The Japan Overseas Trawlers Association, which since 1966 has been developing plans to explore the northwest Atlantic fishing grounds, has selected the 2,500-gross-ton trawler "Kaimon Maru" for the survey. The trawler, owned by Nihon Suisan and operating off Las Palmas, was scheduled to depart for the northwest Atlantic around April 20 on a 90-day trip. Its objective was to survey the waters off the U. S. east coast from Florida northward to around 42° N. latitude (off Massachusetts).

That area was explored recently by the 300-ton trawler "Taiyo Maru No. 32" without success. The vessel ended test operations on March 17. ("Shin Suisan Shimbun Sokuho," April 8, 1967.)

* * *

SURVEY TEAM RETURNS FROM PERU AND MEXICO

The Japanese fishery specialists sent to Peru in early February 1967, and later to Mexico, by the Japan Fishery Resources Conservation Association to investigate fishery conditions, completed their surveys and returned in mid-March.

They found Peru highly interested in developing her abundant fishery resources and eager for Japanese technical assistance and study. Since Peruvians do not eat much fish, the survey team noted the need to develop techniques for processing fish into acceptable forms. It also emphasized the need for capital investment compatible with Peru's national interests and aimed only at long-term gains. ("Suisan Tsushin," March 25, 1967.)

* * *

TUNA LONG-LINE REEL NEEDS TO BE IMPROVED

The Japanese Government-operated research vessel "Shoyo Maru" (604 gross tons) returned March 26 after a 5-month tuna survey



Japanese factory fishing vessel "Tokei Maru" processing king crab for food. (Photo: U. S. Coast Guard)

Japan (Contd.):

cruise to the Atlantic and Pacific Oceans. It tested the new long-line reeling device. Due to operational defects, the gear was found to need further research before it could be used commercially. The Shoyo Maru is scheduled to depart around November 1967 to retest the gear. ("Suisancho Nippo," April 7, 1967, and other sources.)

* * *

TAIYO TO FISH TANNER CRAB
IN BERING SEA

Taiyo Fishing Co. plans to conduct experimental tanner crab fishing this year in the Bering Sea with the "Banshu Maru No. 5" (3,678 gross tons). The vessel, assigned to the Bering Sea gill-net herring fishery, also will harvest the unutilized tanner crab resource in Bristol Bay and other areas in the Bering Sea.

Production target is 100-150 tons of frozen crab meat. If this operation is successful, Taiyop plans to send a canning factoryship to the Bering Sea for full-scale operations aimed at producing annually 375,000 cases (48 $\frac{1}{2}$ -lb. cans) of canned crab meat for export. ("Suisan Keizai Shimbun," April 17, 1967.)

* * *

SETS NORTH PACIFIC WHALE QUOTA

On April 14, the Japanese Government announced a whale catch quota of 1,001 blue-whale units for the 16th (1967) North Pacific Whaling Expedition, the same as the 1966 quota. The catch limit for fin whales, however, was reduced by 11 percent, to 1,126 whales.

On April 22, the Fisheries Agency licensed the operation of 3 whaling fleets scheduled to participate in the 1967 expedition. Catch targets assigned to the 3 fleets are:

Name of Firm	Whaling Fleet	Catch Quota
		Blue-Whale Units
Kyokuyo Hoge	"Kyokuyo Maru No. 2"	467
Taiyo Gyogyo	"Nisshin Maru"	267
Nihon Suisan	"Tonan Maru"	267

Scheduled fleet departure dates from Japan are: "Nisshin Maru," May 12; "Kyokuyo Maru No. 2," May 13; "Tonan Maru," May 15. ("Suisan Tsushin," April 24; "Suisan Keizai Shimbun," April 17, 1967.)

* * *

GOVERNMENT RESEARCH
VESSEL LAUNCHED

The Japanese Fisheries Agency's new research vessel "Kaiyo Maru" (3,200 gross tons), largest of its kind in Japan, was launched on April 24 at the Kanasashi Shipyard in Shimizu. It is a stern trawler type designed for deep-water trawling with a complement of 71 and capable of operating under all climatic conditions. The Kaiyo Maru will carry a portable boat with which to operate drift-net, surrounding-net, and long-line gear. Completion is scheduled for September 10, 1967.

Specifications: total length 84.65 meters (282.4 feet); beam, 15 meters (49.2 feet); draft, 9.2 meters (30.2 feet); speed, about 13.5 knots. ("Suisan Keizai Shimbun," May 1, 1967.)



Communist China

BUYS TUNA VESSEL FROM JAPAN

The largest tuna vessel (320 gross tons) in the fishing fleet of Mainland China was purchased from the Japanese early in 1967. Named "Yuan Yu 702," the vessel is 43 meters (141 feet) long and has a 750-hp. diesel main engine capable of developing a maximum speed of 12.5 knots. Cruising speed, however, will be 10.5 knots. A tunnel freezer operated by ammonia compressors has a daily freezing capacity of 6.5 metric tons of fish. The frozen product will be kept in holds refrigerated to -20° C. (-4° F.). ("Fishing News International," April 1967.)

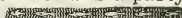


Pakistan

CLAIMS 12-MILE TERRITORIAL WATERS

On December 28, 1966, the President of Pakistan proclaimed the extension of territorial waters to 12 nautical miles from coastal base lines. (U. S. Embassy, January 2, 1967.)

On February 19, 1966, Pakistan had claimed fishing limits of 12 nautical miles from the coastline; the right to establish conservation zones up to 100 nautical miles from outer limits of territorial waters. Also, she claimed the right to regulate fisheries in the zones so established, subject to any international agreement to which she was a party.



SOUTH PACIFIC

Australia

REPORT ON FISHERY EXPORTS AND IMPORTS, JUNE-DEC. 1966

Australian shrimp exports for July-December 1966--the first half of fiscal year 1966/67 (July-June)--were 1,755,000 pounds worth US\$1,875,000 (433,000 lbs. or 58% above 1965/66 period). This is reported by the "Australian Overseas Trade in Marine Products" of the Fisheries Branch, Commonwealth Department of Primary Industry.

Exports to the U. S. increased sharply--to 154,000 lbs. worth \$189,000, compared to 63,000 lbs. worth \$54,000 in the 1965/66 half-year to December 31. Japan remained Australia's best customer; she imported 1,132,000 lbs. worth \$1,250,000.

Abalone exports also rose in quantity and value. The 1,077,000 lbs. of meat were worth \$551,000, up 73 percent over the 1965 period. Of that amount, canned abalone was worth \$401,000. Malaysia, Singapore, and Japan took the bulk of exports.

Value Down Slightly

Value of marine products exported was \$10,247,000--\$208,000 less than the 1965 period, due mainly to a 30-percent drop in value of spiny lobster tail exports. Lobster tail shipments for the first half-year in 1965/66 were particularly heavy because of a carry-over from a year earlier due to shipping difficulties; exports were worth \$3,838,000, compared with \$5,482,000 a year earlier.

Scallop exports dropped by \$24,000 in December but rose by \$25,000 for the 6-month period.

The value of cultured pearl exports for the half-year was \$1,732,000--an increase of \$552,000.

The value of marine products imports dropped slightly. They totaled \$17,562,000, compared to \$17,680,000 for the first 6 months in 1965/66 year.

The value of fish fillet imports in packages of one pound or less jumped 81 percent to \$2,855,000. But imports of similar fish

in packs greater than one pound fell 4½ percent to \$1,972,000. ("Australian Fisheries Newsletter," April 1967.)



New Zealand

SEIZES JAPANESE VESSEL

A New Zealand patrol boat seized a Japanese fishing vessel April 27 charging it was violating territorial waters. The vessel reportedly was fishing beyond the 3-mile sea limit--about 8 miles from the coast. On April 29, the vessel was fined 22 pounds 10 shillings (US\$63) and her catches were confiscated. ("Shin Suisan Shimbum Sokuho," May 2, 1967.)



American Samoa

TUNA PRICES DROP

Japanese tuna suppliers and U. S. packers in American Samoa agreed on tuna delivery prices for April 1967. The new prices are a substantial reduction from March and January 1967 prices. ("Suisan Keizai Shimbum," April 10, 1967.)

The tuna price for January, unsettled since end of 1966, was decided in mid-month. The compromise was a drop of US\$20 for both albacore and yellowfin, and a drop of \$10 for big-eyed.

The prices for April 1967 and previous months were:

	1967		1966			
	Apr.	Jan.	Dec.	Nov.	Oct.	Sept.
	(US\$/Short Ton)					
<u>Albacore, round:</u>						
ship-frozen.	345	390	410	410	400	390
iced.	330	375	395	395	385	375
<u>Yellowfin, gilled</u>						
and gutted:						
ship-frozen.	305	350	370	370	365	355
iced.	285	330	350	350	345	335
<u>Big-eyed, gilled</u>						
and gutted:						
frozen	205	-	-	-	-	-
iced.	195	-	-	-	-	-



AFRICA

South Africa

MORE FISH MEAL FACTORYSHIPS PLANNED

Within the next year or two, South Africa will have 3 fish meal factoryships in operation. The 31,220-ton dead-weight tanker "Suiderkruis" arrived in Cape Town in February to be converted in 3-3½ months into South Africa's second fish meal factoryship at a cost of US\$1,400,000.

The 671-ft. vessel was bought for \$2,100,000 in 1966. The company's capital is \$5,600,000. A second company with \$2,500,000 will run a fleet of catchers to feed this processing ship and a second to be commissioned later.

The project will benefit from an appraisal of the "Willem Barendsz" operation, which established a successful formula for flotilla fishing on the grand scale. There probably will be significant innovations, including a plan to transship directly into cargo vessels at least some fish meal at sea.

The Suiderkruis will be fed by about 18 catchers of various sizes and types from existing factory stock. Later, the company will build boats designed for the job—with steel or glass reinforced plastic hulls.

Of the 120-person ship's complement about 70 will work in the factory.

It will have 2 fish meal reduction lines with a capacity of 70 tons an hour—10 tons more than the Willem Barendsz.

From the catchers' holds, the fish will be pumped aboard the factoryship by two 12-inch units and will pass to fish pits.

The Barendsz's First Anniversary

On March 1, the first anniversary of her arrival in Table Bay (Cape Town), the 30,000-ton Willem Barendsz was preparing to leave on her 4th trip. It is the world's biggest and South Africa's pioneer fish meal factoryship.

It had spent only 3 weeks in port discharging its cargo of fish meal. This period, the shortest yet, indicates progress in over-coming handling problems that initially had dogged the vessel.

"We have had no problems in bulking or bagging the meal," explained a company spokesman. "The difficulty has been to find a technique which will enable us to discharge rapidly.

"We are trying out different techniques each time the ship comes into port and once we have established which of them will give us the quickest discharge, we will install permanent equipment. Because this venture is the first of its kind, we have no effective precedent to investigate. All the work involved has to be original."

In her first 3 trips, the vessel processed a total of 98,000 tons of fish. While the ship and reduction machinery functioned completely satisfactorily, the 72-ft. wooden seiners have not proved ideal for this type of flotilla fishing. The original fleet of 7 was expanded to 9 after the first trip, and the company is now experimenting with a 110-ft. steel boat, the "Silver Angler."

Good Social Amenities for Fishermen

"In view of the fact that the fishermen have to stay at sea for so long," explained the spokesman, "it is the company's policy to provide good social amenities, both on the catchers and on the mothership. We therefore feel that another type of boat must be developed specially for this project. The Silver Angler has already completed one trip successfully.

"In time, we hope to build a fleet of specialist vessels to our own design which will be based on our operating experience."

Although the company has decided to improve the amenities, no difficulty had been experienced in finding crews. In fact, the good rewards associated with a high catching rate have drawn applications from all over South Africa.

All catchers now are fitted with U.S.-made submersible fish pumps to transfer fish from net to hold. But the fish still are pumped from there to the factoryship by an eight-inch unit mounted on the "floating jetty."

In her first year in South African waters, the Barendsz has spent only 100 days actually working at sea. The other 265 have gone to

South Africa (Contd.):

lengthy conversion and other factors. "It has therefore been a year of expenditure rather than income," commented the spokesman, "and it is difficult to say what the ultimate profitability of the venture will be in a normal full year of operation. However, on results achieved so far, the directors feel confident for 1967." ("The South African Shipping News and Fishing Industry Review," March 1967.)

* * *

ANCHOVY WAS 46% OF 1965/1966 CATCH

The full significance of the anchovy--only recently exploited in South African waters--to the reduction plants is reflected in statistics of the Fisheries Development Corporation of South Africa Limited.

They reveal that while total landing of shoal fish declined by 17 percent--from 536,082 short tons in 1964/65 to 444,276 short tons in 1965/66--the contribution of anchovy towards the total catch increased from 40 to 46 percent. Considering that August and September 1966 were "open" months for catching all types of fish, while during the same period of 1965 catching anchovy only was permitted, the anchovy part of total landings, when compared with pilchard, appears significant.

Pilchard Catch Decreases

The decreasing pilchard catch (in 1964/65 42 percent of total catch and 29 percent in 1965/66) reflects a disappointing commercial development. The anchovy is still regarded as an "industrial" fish. It is not used for direct human consumption, and processing it for this purpose is both time consuming and difficult. Unlike the pilchard, it is not acceptable for immediate canning. As an alternative raw material for fish meal and oil factories, it suffers by comparison with the pilchard on which the local industry was founded. The anchovy returns a lower oil yield, deteriorates more rapidly, and it is relatively more expensive to catch. ("Barclays Trade Review," April 1967.)



South-West Africa

COMMISSION REPORTS ON FISHING INDUSTRY

The 3-man Commission of Inquiry into the Fishing Industry of South-West Africa, appointed by the South-West African Administration, has submitted its report after a 10-month study. It calls for legislation setting up a Fisheries Research Council to replace the existing Fisheries Research Laboratory and to be financed by public and private funds. The Council would assist the industry in applying research findings. Suggested areas of study are the exploitation of anchovy, maasbanker, and white fish. To finance the Council, the Commission proposes supplementary sardine quotas of 6,000 tons per factory (now 90,000 tons each) to be taxed at R 5 (about US\$7) per ton.

The report urges that the 2 huge factory-ships operating off South-West Africa be removed because they are depleting resources while contributing nothing to South-West Africa. The ships are licensed in South Africa and owned by South Africans. If these ships are removed, the report favors the issuance of 2 new licenses for sardine (pilchard) fishing, with quotas of 90,000 tons each. (A license for sardines also is proposed for the struggling white fish industry.) The new licenses would allow use of Walvis Bay only until facilities proposed for Ricky Point, on the North coast, are completed.

Plans for Walvis Bay

The Commission recommends expansion and improvement of the port of Walvis Bay. It proposes construction of a 10,000-foot sea wall 400 feet off shore, and parallel to it, to protect existing and proposed wharves and warehouses. It believes the Administration should provide the necessary R 3 million (about \$4,200,000).

The report, rejecting the suggestion that Walvis Bay have a fish flour plant, says there is no real market for fish flour (also called Fish Protein Concentrate or FPC).

The Commission also recommends that no new licenses for fishing or factories, except for a white fish processing plant, be awarded in Luderitz.

A fast patrol boat should be bought to allow greater surveillance of fishing activities and to help prevent the use of illegal or wasteful fishing practices.

South-West Africa (Contd.):

Sardines Nearly Depleted

The Commission noted several factors indicating sardine population may be on verge of depletion. The Director of Sea Fisheries in South Africa has reported an absence of sardine ova in many areas off South-West Africa and a sharp decrease in spawning. The large increase in the anchovy population is said to mean that the sardine population has dropped drastically. Annual sardine catches off South Africa have dropped from 450,000 tons to 125,000 tons since the quotas for South-West Africa were raised. (Sardines migrate southward.)

Despite these factors, the Commission asks for 3 more sardine licenses with quotas of 90,000 tons each. Two licenses would be contingent on the prior departure from South-West Africa of the factoryships. The report recommends removal of tonnage restrictions on sardine vessels and proposes instead that the number of boats in service be limited. It suggests that no new sardine canneries be licensed.

The sardine industry is to be used as a support for the white fish industry in 2 ways: (1) research and development geared principally to white fish will be paid for by the proposed levies on the extra sardine quotas of 6,000 tons per ship per year; (2) a quota for sardines is to be allowed holders of white fish licenses.

Problems of White Fish Industry

There are 8 licensees in South-West Africa to catch white fish. In 1965, the take was only 11,830 short tons; foreign trawlers off South-West Africa, however, continue to take large quantities. The industry is plagued by a limited local market, high rail and electricity rates, and poor processing and packaging facilities. The Commission proposes that the small companies form a central marketing agency in conjunction with the white fish firms in South Africa.

The report asks that the companies consider merging into one viable entity, either as a new company or through a board com-

posed of all. If the resulting organization agreed to build a white fish processing plant with initial annual production of 20,000 tons and 90,000 tons within three years, the Commission would grant it a lucrative sardine license of 90,000 tons annually to bolster its financial position. This new factory should be situated at Luderitz. Protection from domestic competition would be guaranteed for a reasonable time.

Depletion of Spiny Lobster

Depletion of spiny lobster is a serious threat. The Commission recommends that certain areas be closed earlier in the year than at present, and that special traps allowing small lobster to escape be introduced. Other protective innovations are suggested, including refusal of new licenses. If quotas must be reduced, sardine quotas should replace them. The Commission calls for use of the lobster offal, presently discarded. Only the tails are packaged, and almost all go to the U. S. (U. S. Embassy, Pretoria, April 14, 1967.)



Senegal

SETS TUNA PRICES

The Government of Senegal issued a decree on March 18, 1967, governing the 1966/67 tuna fishing season.

The basic provisions are the same as those for the 1965/1966 season: tuna prices remain at 82.50 francs CFA (\$0.34)/Kg. (\$340 a metric ton) for albacore and 55 francs CFA (\$0.22)/Kg. (\$220 a metric ton) for skipjack.

The French import quota of 11,000 tons of canned tuna from Senegal continues to be allotted among the three canneries. (U.S. Embassy, Dakar, Apr. 22, 1967.)



ARTICLES

A submersible pump produced results comparable to those of a vessel-mounted system.

DEVELOPMENT OF A SUBMERSIBLE PUMPING SYSTEM FOR A HYDRAULIC SURF CLAM DREDGE

By Mark L. Standley* and Phillip S. Parker**

An electrically driven submersible pump was tested as a means of supplying water to a surf clam dredge. A 65-horsepower submersible pump was mounted on a 48-inch clam jetting dredge. The pump supplied 2,000 gallons per minute directly to the jet manifold of the dredge. Comparison tows were made with the submersible system and the standard vessel-mounted pumping system to determine their relative efficiencies. The submersible pump operated satisfactorily and gave results comparable to the vessel-mounted system. Advantages of the new system are ease of handling and greater efficiency in power transmission.

The history of the development of surf clam harvesting gear, like that of most other fishing gear, reflects a long, slow, evolutionary process. Advances have been dictated by the need to increase efficiency to keep the fishery economically feasible. Surf clam gear is advancing today at a more rapid rate than the early change from hand tonging to dredging. The use of a dredge towed by a vessel began in the 1920s, and the development of a hydraulic jet dredge took place during the mid-1940s. Since then, little change has taken place in the basic principles of hydraulic dredging, but the size and efficiencies of the gear have grown to the point where larger dredges do not appear feasible (fig. 1).

As dredges increase in size and greater flow rates to the jet manifold are required, the problems of handling the large hoses and the lost efficiencies in transferring water through them lead to the conclusion that a submersible pump mounted directly on the dredge would be a desirable development in the evolution of the surf clam dredge.

A submersible pump, driven by an electric motor, would eliminate the bulky, cumbersome hoses now used (fig. 2) and replace them with a single electric power line, which could be handled and stored on a winch (fig. 3). The

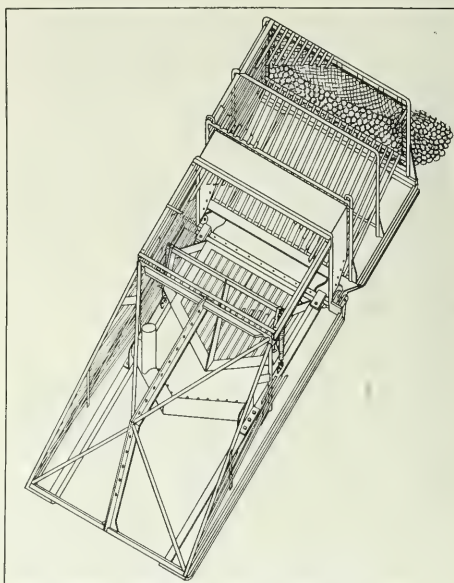


Fig. 1 - Drawing of 48-inch hydraulic surf clam dredge used aboard the "Delaware" for surf clam survey.

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Note: All statistics are in the appendix to reprint (Separate No. 793) of this article. For a free copy of the Separate, write to Office of Information, U. S. Department of the Interior, Fish and Wildlife Service, BCF, Washington, D. C. 20240.

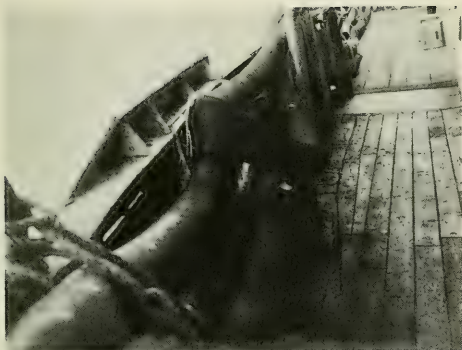


Fig. 2 - Clam jetting hose faked out aboard the Delaware.

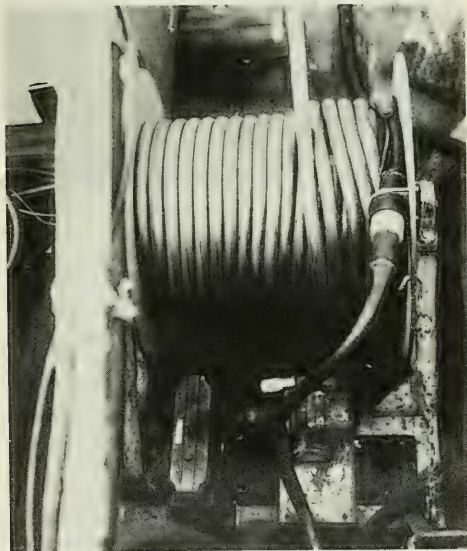


Fig. 3 - Electrical cable wound on winch showing shipboard termination watertight plug.

efficiency of transmitting electrical power to the pump is far greater than transporting water through hoses, a factor that becomes increasingly important as the water volume and pressure and length of hose increase.

DEVELOPMENT

Before the 1920s, hand tonging and hand raking were the common methods used to har-

vest surf clams; during the 1920s, dredges were developed that were towed with powered vessels. The dredges were commonly 18 to 28 inches wide with a scraper or knife blade attached between the dredge shoes at a fixed depth. These dredges were prone to clogging with sand and mud, and many clams were broken by the blade. These deficiencies and the need for even more efficient equipment led to the development of the hydraulic jet dredge in the 1940s (Westman, 1946).

Hydraulic dredges, a logical step from the dry scraper types, were developed by adding to the dredge a pipe manifold with a few nozzles or jets directed downward in front of the blade. A fire hose connected the manifold to a pump mounted on the towing craft. Because the water jets loosened the bottom, the dredge could cover a greater area in the same amount of time, and areas were opened to dredging that were too hard for the dry dredges to operate effectively (Westman, 1946). The incidence of broken clams (Parker, 1966) and damaged meats in the catch were reduced substantially by this new development (Ruggiero, 1961).

Since its introduction, the hydraulic dredge has increased steadily in size until now 40-inch blades are common, and a dredge with an 84-inch blade is in service on the east coast. The volume of water required has increased correspondingly with the dredge size; a 40-inch or 48-inch dredge requires about 1,600 to 1,800 gallons per minute--at about 60 pounds per square inch differential pressure between the inside of the manifold and the outside water pressure, regardless of depth. Vessels fishing with these size dredges use a 5-inch or 6-inch inside diameter hose of rubber and fiber especially developed for the clam dredging industry. The largest dredge (84 inches) needs two pumps and two hoses to supply water to the manifold (fig. 4).

The use of hose to supply water to the manifold has some disadvantages that can be overcome by the use of a pump mounted directly on the dredge. The head loss or energy drop of the water in a hose is proportional to both the hose length and flow rate; in the usual lengths (200 to 250 feet) used aboard commercial vessels, this loss is 20 to 30 pounds per square inch, or about 25 percent (table 1--see note on p.). Transmission losses can be reduced greatly by transmitting energy to the dredge in the form of electricity. This factor becomes more important as deeper depths are fished. An electric cable is easily stored on

a powered reel, eliminating the heavy work of handling the hose. The installation of a generator, switches, cable, and cable handling winch is a good deal simpler than installation of large sea chests, valves, pump, and piping in either new construction or conversion work.

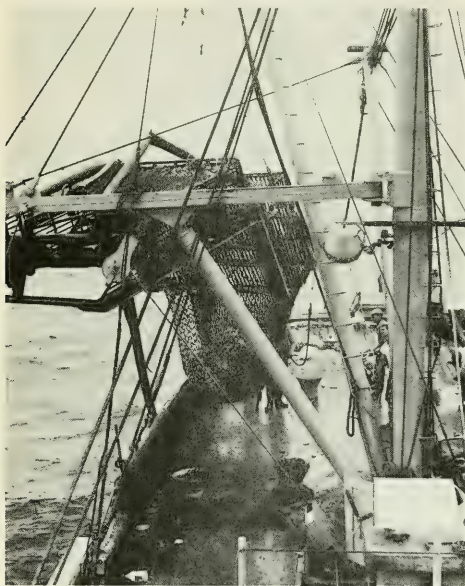


Fig. 4 - An 84-inch dredge used aboard the "Gail Borden" for commercial surf clamming.

METHODS AND PROCEDURES

Early in 1965, the M/V "Delaware" was fitted out for a surf clam survey along the coast of the Mid-Atlantic Bight. A sea chest, a 6-inch centrifugal pump powered by a 110-horsepower diesel engine, and the necessary deck piping and hose were installed to supply water to a 48-inch dredge. The jet manifold on the dredge is V-shaped and has 14 nozzles pointed downward and 4 additional nozzles (blowback nozzles) pointed aft to help keep the cage and chain bag clear of sand and mud. During our surf clam surveys, many different-sized jets have been tried ranging from 0.50- to 0.81-inch diameter, and we have concluded that 0.625-inch diameter nozzles produce the optimum flow and pressure with this equipment (table 1).

Industry and research organizations have considered for some time replacing the vessel-mounted pump and hose connection with a submersible pump. Such a system was envisioned for the Gloucester Exploratory Fishing and Gear Research Base's new vessel, the "Delaware II," which is to have ample electric power available for a submersible pump. Delays in delivery of the new ship, however, made it desirable to progress with plans to refit the Delaware for such an operation.

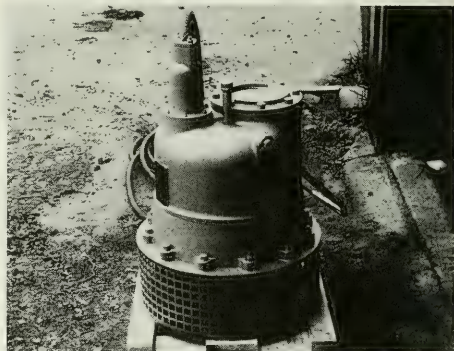


Fig. 5 - Commercially available electrically driven submersible pump.

A commercially available electrically driven submersible pump was acquired for use on a modified 48-inch dredge (fig. 5). An oil-filled synchronous induction motor rated at 65 horsepower at 1,750 revolutions per minute powers the pump. The motor's maximum power requirement is 75 kilowatts. The motor and pump are in a cast aluminum housing, but other pump parts are of stainless steel or Monel. The pump impeller is cast stainless steel 12 $\frac{1}{4}$ inches in diameter.

The dredge used in this experiment was made to our specifications. It has shoes or runners of longer and heavier proportions than those usually used in industry. A steel plate was fitted between the shoes forward of the manifold to facilitate mounting the pump unit and to protect it from bottom obstructions (fig. 6). The pump was mounted across the forward end of the dredge under the towing bar and braces (fig. 6). The 8-inch pump discharge was connected directly to the manifold with a reducing elbow and a short length of 6-inch hose (fig. 6). The latter was deemed advisable as a precaution against shock and vibration.

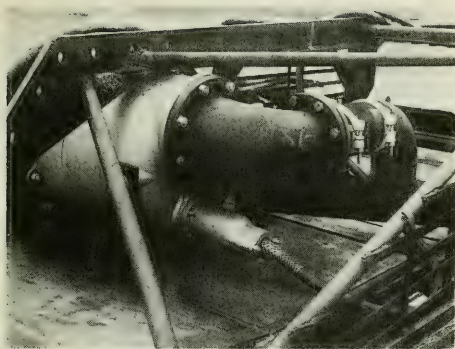


Fig. 6 - Submersible pump mounted on our 48-inch hydraulic dredge showing position of mounting, discharge connection, and rubber union.

A neoprene-jacketed 4-wire No. 2 American Wire Gage power cable supplied power to the pump. This cable was fitted with watertight plugs at the dredge end and the shipboard termination (fig. 3). The 150-fathom cable was stored on a hydraulically driven reel. Five double 8-inch diameter trawl floats were attached to the cable along the first 10 fathoms (fig. 7). These floats held the cable clear of the bottom during towing and haulback operations. After initial development work in determining the proper leads and flotation for the cable, we encountered no difficulties in keeping the cable from between the dredge and the side of the vessel or clear of the bottom.

To record the pressures at the jet nozzles, a remote reading differential pressure gage was used. This instrument recorded the pressure on the inside of the manifold relative to the pressure of the water at the dredge's depth. Pressures were read at the surface and at working depths with different combinations of nozzle diameters and pump speeds (table 1). Small variations in the speed of the submersible pump were possible by varying the revolutions per minute of the generator. This change was limited to about 10 percent of the generator's design speed of 1,200 revolutions per minute for 60 cycle per second current.

To assess the operation of the submersible pump relative to that of the usual vessel pump and hose arrangement, a series of comparative tows was made within a confined area with each rig. To carry out this procedure, the dredge was provided with two jet manifolds, one adapted to the submersible pump, the other to the 6-inch hose from the vessel. Change-

over from one rig to the other could then be done in a very short time. The same number of tows was made with each setup in each area.



Fig. 7 - Dredge about to be taken aboard the Delaware showing catch in bag and power cable with attached floats.

RESULTS

Water pressures and volumes obtained with the submersible pump compared quite closely with those obtained at the manifold with the shipboard pump and hose (table 1). Nozzles with a 0.625-inch inside diameter were used during the fishing. The pressure drop in the 250 feet of 6-inch diameter rubber hose, plus deck piping, amounted to 27 pounds per square inch or about 26 percent. The total energy drop was 30.5 percent, resulting in an efficiency of 69.5 percent for the conditions selected for fishing. The calculated energy drop in the power cable at full output was only 5.6 percent. The resulting savings in fuel costs and equipment handling would help to justify the additional expense of the submersible pumping system during its lifetime.

During one group of comparative tows, the submersible pump dredge appeared to be catching only about one-half as much as the conventional hydraulic dredge. Upon inspection of the dredge, we discovered that small

stones were being picked up by the pump through the expanded metal screen but were not passing through the nozzles. This situation was remedied by fastening a piece of $\frac{1}{2}$ -inch mesh hardware cloth with metal strapping over the expanded metal screen. After this alteration, little or no difference was seen in the performances of the dredges, and the submersible pump, therefore, was used throughout the remainder of the survey (fig. 8).

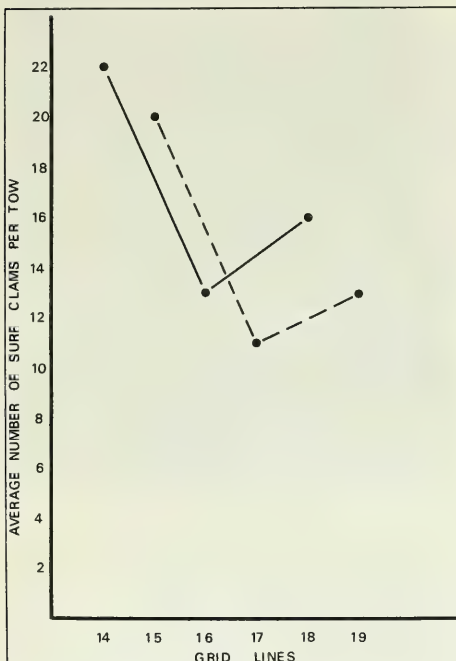


Fig. 8 - Average catch of surf clams for selected grid lines. Solid line, vessel pump; dash line, submersible pump.

DISCUSSIONS AND CONCLUSIONS

From the trials conducted aboard the M/V Delaware, the use of an electrically powered submersible pump to supply water to the jet manifold is technically feasible. Standard off-the-shelf pumps are available that will fulfill the requirements. The danger of the cable snagging on a bottom obstruction can be nearly eliminated by the use of flotation schemes. By proper leads and dredge handling techniques, the problem of the cable being crushed between the dredge and the vessel can be over-

come. The possibility of the intake being obstructed by bottom debris or vegetation, or small stones being drawn in, can be avoided in several ways. The pump could be oriented so the intake is farther above the bottom and close to the centerline of the dredge, or intake piping can be extended to a more advantageous location. Properly sized screening will prevent stones clogging the nozzles.

The added weight of the pump on the forward end of the dredge did not appear to affect adversely the dredge's performance. Possibly, it may have been beneficial in causing the dredge to "tend bottom" better.

To make the submersible pump dredge a better tool, slight modifications should be made in the design of the dredge sled. The runners should be extended far enough in front of the jet manifold to allow ample room for the pump, and bracing for the towing bar should be altered to suit the pump used. This last alteration should allow convenient access to, and removal of, the pump for service and maintenance.

The installation of a submersible pumping system involves more equipment than the usual vessel-mounted pump and hose arrangement. A generator of sufficient size must be mounted in the vessel, together with the proper starting equipment and overload protection devices. The connector cable is most conveniently handled on a powered reel, which could be mounted anywhere aboard ship that would best suit the operation. Disconnect plugs are at each end of the power cable to enable the dredge to be removed from the vessel, or the cable to be reeled in at the end of the fishing. The pump is mounted with brackets to the dredge, and connected directly to the manifold with a short length of hose or a flexible connection.

The total of the initial and installation costs of the submersible pumping system is more than that of the system in use now. The cost and installation of the generating set, however, compare favorably with the cost of a pump engine, pump, sea chest, and related couplings and installation. As the trend in industry is to larger hoses, up to 8-inch diameter are used today, and the cost of this hose and the sleeves and clamps for joining sections is a very large part of the expense of outfitting for clam dredging. In contrast, the cost of cable is comparatively small, and this saving increases as deeper depths are fished.

In addition to the somewhat more elaborate gear necessary aboard the vessel for submersible pumping, the pump unit with an integral electrical motor is mounted on the dredge itself. The cost of this unit, its installation, and the modified dredge probably would run four or five times the price of a conventional dredge. However, this added cost is offset by the greater efficiencies realized and the convenience of handling the comparatively small electric cable. The additional expense is also reduced by the less expensive cable in place of the expensive hoses.

A dredge with a proper pumping unit delivering a like volume and pressure to the jet manifold as a vessel-mounted pump has proved to fish just as well as the latter.

Taking the aforementioned factors relating to cost, efficiency, and catch rates into account, an electrically powered submersible pumping system appears to compare very favorably for conversions or for new construction to the conventional system.

SUMMARY

1. An electrically driven submersible pump was tested and used for a surf clam survey.

2. The pump, powered through a 4-conductor (No. 2 American Wire Gage) cable, furnished up to 2,000 gallons per minute to the manifold jets.

3. The water was supplied directly to the jet manifold by the pump, which was mounted on a plate across the forward end of the dredge.

4. Comparison tows made between the submersible pumping system and the standard vessel-mounted pumping system indicated that the former could be used to replace satisfactorily the vessel unit.

5. To make the submersible pump dredge a good practical tool, slight changes will have to be made in the standard dredge design.

6. The installation of a submersible pumping system will involve more equipment than the standard vessel pump and hose arrangement. Although the total cost is somewhat higher, it is offset generally by the greater efficiencies realized from the submersible pump and convenience of handling the smaller electrical cable.

7. When everything is considered, the submersible pumping system appears to be practical for conversion or for new construction.

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Created in 1849, the Department of the Interior—a department of conservation—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.



The business and scientific aspects of the fishing industry are now so closely related that the businessman cannot afford to neglect scientific advances. Here are some basic ideas and terminology in fishery science he may find helpful.

BASIC IDEAS IN FISHERY SCIENCE

In the last half century, changes in the fishing industry have come about rapidly. The design of fishing vessels and gear; the methods of locating, capturing, handling, and preserving fish at sea; the techniques of processing, packaging, and distributing fish ashore--all differ markedly now from the old designs and ways of doing things.

What has caused this rapidly accelerated rate of change in the modern fishing industry? The answer: adoption of scientific methods. Once research is started, new ideas develop and new products and better methods ensue. The gear manufacturer alters his product so that newly available species can be used efficiently; the processor adapts his methods to changes in types of fish caught; the researcher expands his field of study to encompass changes in fish types

and product usage. All these interlocking and interrelated aspects of the industry progress together.

One obvious result is better, more varied product--often at a lower price. Still another result is an increasingly rapid rate of obsolescence. And the price of obsolescence is high.

It is obviously difficult for even the specialist to keep abreast of all new developments in his field. It is impossible for any one person to be familiar with developments in all fields. But to stay in business in the modern fishing industry, we must recognize that changes are occurring rapidly and that we must be aware at least of the areas in which major changes occur.

-F. Bruce Sanford

I - PRESERVATION OF FISH BY THE USE OF GAMMA RAYS

By Louis J. Ronsivalli,* Lena Baldwin,** and F. Bruce Sanford***

Fresh fish, both finfish and shellfish, have excellent flavor qualities, but maintaining freshness has always been a problem because fish spoil rapidly if left untreated. Since early times, fish have been salted, smoked, pickled, or fermented. Although these treatments impede the advance of spoilage, they change the flavor appreciably.

More recently, fish have been canned, frozen, or chilled. The tastes of these newer products, particularly those chilled, come closer to the goal of freshness, but they, too, may lack something of the natural fresh flavor. For a few days, chilled fish retain the taste of freshly caught fish. Beyond that

time, however, spoilage becomes noticeable and the product begins to lose its quality of freshness. Since canned and frozen fish lose their fresh taste either during processing or subsequent storage--and since chilling has such a short period of effectiveness--truly fresh-tasting fish ordinarily have been available only to people within easy transportation range of the capture areas.

Now, however, many people who live beyond that range also may enjoy the fresh-fish flavor. When chilling is combined with a gamma-radiation treatment, the period of freshness is extended markedly, long enough to permit fish to be shipped great distances.

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Because the novelty of the method might discourage its use, we will describe it, review briefly the general attributes of radiation--what it is and how it preserves food--and then show in particular how radiation treatment can be used to preserve fish.

RADIATION

What Is Radiation? The radiation we are primarily concerned with is the energy that passes in invisible waves through space. A familiar kind is the energy that flows constantly from the sun and reaches the earth principally as light rays and heat rays. We can see and feel the presence of this energy. As a matter of fact, we need it for life. Ultraviolet rays, X-rays, and gamma rays are other kinds of radiation energy.

Except that gamma rays are of shorter wavelength and more energetic, they are very similar to X-rays, ultraviolet rays, and other forms of electromagnetic radiation. Our interest in radiation is centered on these energetic, invisible gamma rays--for, properly controlled, they can be used to destroy bacteria. And the preservation of food depends primarily on the controlled destruction of bacteria.

How Does Radiation Preserve Food? Foods normally are spoiled by bacteria, present by the millions in the meat and fresh fish we buy. To understand how our foods can be protected from these food-spoiling agents requires a close look at what goes on when the bacteria are exposed to a given amount of gamma radiation at some predetermined rate.

How Does Gamma Radiation Destroy Bacteria? Using gamma radiation to destroy bacteria can be direct, much like using a machine gun on them would be direct. The radioactive source is the gun, the gamma rays are the bullets, and the result of a direct hit is relatively instantaneous. Destroying bacteria with radiation can also be indirect, the result of secondary chemical effects set in motion within the environment of the bacteria. One such effect is produced as follows: When bacteria are irradiated, hydrogen peroxide (H_2O_2) is formed from the water (H_2O) that makes up a large part of the bacterial cell. Hydrogen peroxide destroys cytochrome oxidase, an enzyme vital to regeneration and growth, both in man and in bacteria. Once this en-

zyme is destroyed and protein synthesis prevented, the bacteria die.

What Determines the Amount of Radiation To Be Used? Evidently, we would not expose food to these powerful rays without regard to amount or time of exposure any more than we would expose our skin willy-nilly to the sun's rays. By the same token, food that is being irradiated is exposed to some measured radiation dose at some determined dose rate. But what is a "radiation dose"? And what is meant by "dose rate"?

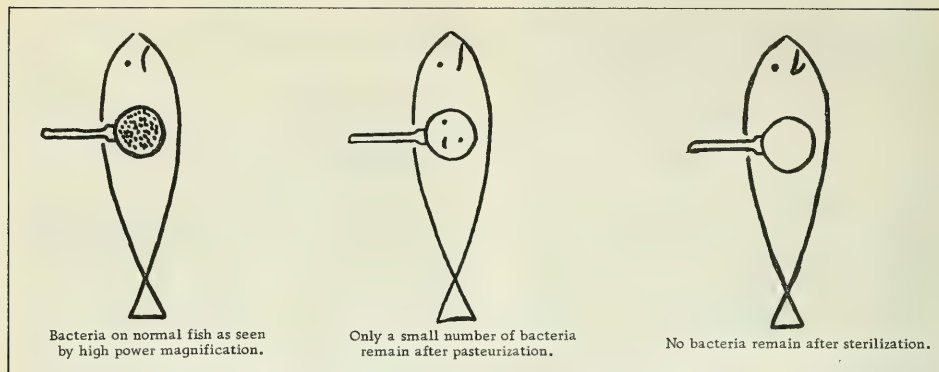
Radiation dose is simply the amount of radiant energy absorbed by a unit mass (usually 1 gram) of the material being irradiated. Radiation dose is expressed in "rads." A rad is to gamma radiation what a calorie is to heat; however, since the rad is such a small unit of energy, it is usually multiplied by a million for practical purposes of measurement. The million-rad unit is commonly called a "megarad."

The dose rate includes a time factor. It is the amount of gamma radiation absorbed in a given time by a unit mass of the material being irradiated. Mathematically, this relation can be simply expressed as $R = \frac{D}{t}$, where R is the radiation dose rate, D the radiation dose, and t the time. Usually dose rate is expressed in megarads per second, megarads per minute, or megarads per hour.

PRESERVATION BY RADIATION

Is Radiation Preservation Suited to Fish? When we think of preserving or prolonging the life of foods, we often think in terms of either sterilization or pasteurization. In common practice, either process requires heat; however, some fish tend to become mushy when treated with heat. Since a food does not become heated during radiation processing, the radiation technique offers an attractive alternative for preserving fish.

What Types of Radiation Preservation Have Been Tried On Fish? Both radiation sterilization and radiation pasteurization have been used. The shelf-life of the resulting products has not been equally long, however, largely because of the difference in number of bacteria destroyed by the two processes (figure).



The effect of pasteurization and sterilization on bacteria in fish.

Radiation sterilization is the process of destroying all bacteria in the fish. Once these bacteria have been eliminated, no others must be allowed to reach the fish; that is why fish are packed in bacteria-tight containers before they are irradiated.

Canned fish (salmon or tuna, for example) sterilized by heat have one decided advantage over fish preserved by other methods: they can be kept unrefrigerated for months, or even years, without spoiling. The reason they last so long is that all the bacteria and enzymes that might cause spoilage have been destroyed. (Enzymes catalyze chemical change even after the bacteria are killed.) Radiation-sterilized fish have an additional advantage over fish that have been heat sterilized: they retain a firmness that heat sterilizing tends to destroy.

Despite these advantages, radiation sterilization of fish has not been too successful. The amount of radiation needed to destroy all bacteria is so high that it ordinarily causes the fish to smell and taste overcooked--or even burned. Still higher radiation doses are needed to destroy the enzymes. Yet the idea of preserving fish by radiation sterilization has not been abandoned. Recent developments have led investigators to believe that radiation at an extremely low temperature will not be accompanied by the off-flavors and off-odors that, up to now, have characterized sterilized fish.

Radiation pasteurization is the process whereby most bacteria--not all--are de-

stroyed. In other words, the bacteria in radiation-pasteurized fish are not eliminated; they are simply reduced in number by subjection to a low level of radiation; thus it is necessary to refrigerate the product. Yet even with refrigeration, pasteurized foods have a relatively short shelf life (a few weeks).

Scientists at the BCF Technological Laboratories at Gloucester, Mass., Seattle, Wash., and Ann Arbor, Mich., have determined the amount of radiation needed to pasteurize many fish caught by commercial fishermen. For example, radiation-pasteurized haddock fillets require about 250,000 rads of gamma radiation. Since radiation-sterilized haddock fillets require about 4,500,000 rads, the term "low level" is used to describe the pasteurizing radiation dose. This 250,000-rad dose, nevertheless, will kill about 99 percent of the bacteria. But the remaining 1 percent can multiply rapidly if the irradiated fillets are not refrigerated, and so the fillets are kept at near-freezing temperatures following pasteurization.

To appreciate how rapidly bacteria can multiply, one need only consider how tremendously the multiplication process accelerates with rising temperature. For example, at 33° F., some bacteria take 10 hours to split in two; at 42° F., each bacterium will split in two in only 2 hours, giving rise to 32 bacteria by the end of 10 hours; and at 70° F., 1 bacterium could generate a million bacteria in 10 hours.

Why are only some bacteria killed at low radiation levels? The answer lies in the nature of gamma rays--the "bullets" ejected by the radiation source--and of the bacteria exposed. Gamma rays are small and travel in a straight line; bacteria are small and scattered throughout the product. As the gamma rays pass through the food being irradiated, they hit only those bacteria that chance to be in their path. If the rays are intense enough and last long enough, the chances are that all bacteria will eventually be hit. But some types of bacteria are more resistant than others and may require several hits before they are destroyed. If some escape this bombardment, they will continue to survive, grow, and reproduce. Thus radiation-pasteurized fish, unlike radiation-sterilized fish, must be refrigerated so that the growth of the few remaining spoilage organisms will be retarded.

Normally, fresh fish last about 1 or 2 weeks when they are stored at temperatures between 33° and 25° F. The 250,000-rad dose used at Gloucester has extended this storage life by at least 2 weeks. In general, the life of these irradiated fish is 2 to 3 times as long as the life of unirradiated fish kept at the same temperature. Expert panels of scientists have judged that the appearance, flavor, odor, and texture of the irradiated fish stored for 30 days are of good quality.

Is Irradiated Fish Safe for the Consumer?
When properly controlled, gamma rays pass through the fish and kill the bacteria without causing the food itself to become radioactive. Tests for radioactivity are relatively simple with geiger-counter-type instruments. Repeated tests with sensitive radiation-detection devices have revealed no instance of the presence of radioactivity in irradiated fish. The destructive force of the radiation is confined to the radiation chamber. Needless to say, it is not healthful to enter the radiation chamber while fish are being processed there--any more than it would be to enter an oven where bread is being baked.

Scientists have carried the safety investigation beyond the areas concerned with the primary effect (radioactivity) into several secondary areas. These investigations have revealed no instance of toxic substances in irradiated foods. The available evidence indicates that irradiated foods, properly handled, are perfectly safe to eat. Even now, irradiated potatoes are being sold in Canada

(radiation prevents sprouting), and grains are being irradiated to destroy insects and insect eggs that commonly occur in grain.

What Are the Prospects for Radiation Pasteurized Fish? The Food and Drug Administration has been petitioned to approve the use of irradiated fish. This petition resulted from years of cooperative study by scientists in BCF technological laboratories and those associated with the U. S. Atomic Energy Commission (AEC). The studies have included not only the possibility of radiation pasteurizing fish at the commercial level, but the cost of producing the product, the problems of distributing it, and the likelihood of consumers accepting it. As a vehicle for these studies, AEC has built a large cobalt 60 fish-processing plant at BCF's technological laboratory in Gloucester, Mass.

What Is the Role of Cobalt 60 in the Future of Commercially Irradiated Fish? Cobalt 60, one of the most promising radioactive sources that emit gamma rays, is being used in the present fish-preservation program. Other radioactive elements could be used as the gamma-ray source, but cobalt 60 has a major advantage over many of the others; it has a reasonably long half-life.

"Half-life" is the unit used to measure the length of time a radio-active substance emits radiation. For example, the half-life of cobalt 60 is 5.2 years--that is, after every 5.2 years, one-half of the radioactivity present at the beginning of the 5.2-year period has been lost. In contrast, uranium Y has a half-life of about 24 hours, and some radio-active elements in the actinium and thorium families have a half-life of a few microseconds. When the processor must pay several thousand dollars for his radiation source, half-life can take on real economic significance.

What Long-Range Effects Can Radiation Pasteurization of Fish Promise? If studies on radiation pasteurizing yield the expected results, pasteurized fish will be available to any part of the world where demand for fresh fish exists. For the consumer, the availability of radiation-pasteurized fish will be more than a taste treat--it will mean the availability of a product whose nutrients are virtually unchanged. The result can hardly be less than increased demand for the product.

With increased demand for fresh seafoods will come increased incentive to accelerate the production rate. And with this increase

will come a vigorous demand for newer and more effective fishing vessels to harvest the seafoods. Thus, all parts of the fishing industry will benefit, along with the consumer.

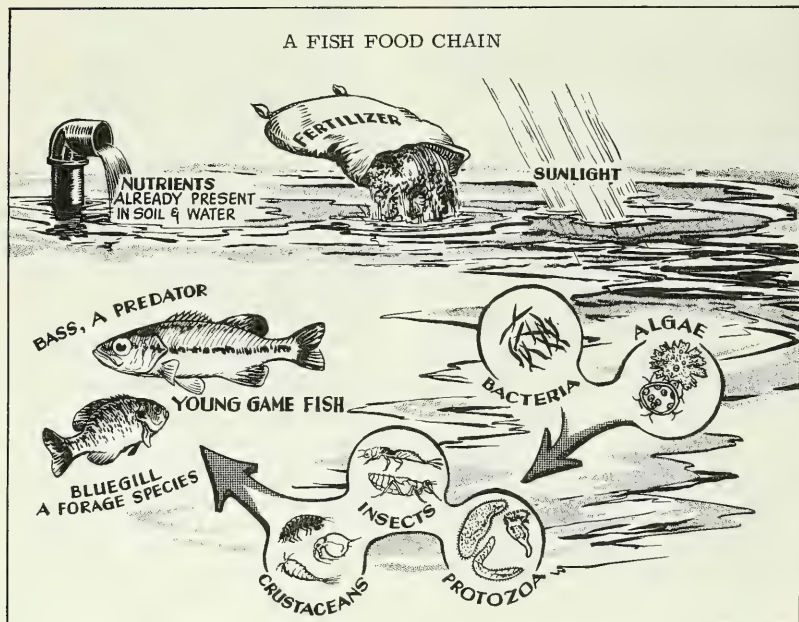
Where Can We Get More Information on Preservation of Fish by Radiation?

Subject	Source
Atlantic fisheries	Laboratory Director Bureau of Commercial Fisheries Technological Laboratory Emerson Avenue Gloucester, Mass. 09131
Pacific fisheries	Laboratory Director Bureau of Commercial Fisheries Technological Laboratory 2725 Montlake Boulevard East Seattle, Wash. 98102

(Listing continued on next column.)

Subject	Source
Great Lakes fisheries	Laboratory Director Bureau of Commercial Fisheries Technological Laboratory 5 Research Drive Ann Arbor, Mich. 48103
Gulf fisheries	Head of the Department of Food Science and Technology Louisiana State University Baton Rouge, La. 70803
Food Preservation by Irradiation," a free booklet by Grace M. Urrows	U. S. Atomic Energy Commission P. O. Box 62 Oak Ridge, Tenn. 37830

Acknowledgment: John Spinelli, Research Chemist, BCF Technological Laboratory, Seattle, Wash., and Francis Joseph Weiss, Science Specialist, Library of Congress, Washington, D. C., contributed many helpful suggestions in the writing of this article; Mary Fukuyama, Editor, BCF Branch of Reports, Seattle, Wash., assembled the bibliography (available in Separate No. 794). For a free copy of the Separate, write to Office of Information, U. S. Department of the Interior, Fish and Wildlife Service, BCF, Washington, D. C. 20240.



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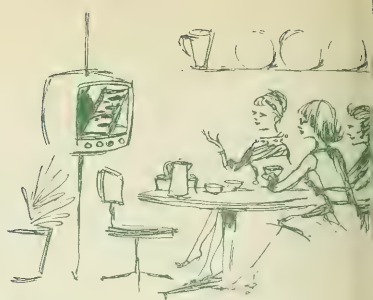
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